Vol. XXIV January, 1948 No. 1

U.S.A. 126

THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in co-operation with
The California Academy of Sciences

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San Francisco, California
1948

THE PAN-PACIFIC ENTOMOLOGIST

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Published quarterly in January, April, July, and October with Society Proceedings appearing in the January number. Papers on the systematic and biological phases of entomology are favored, including articles up to ten printed pages on insect taxonomy, morphology, life history, and distribution.

Manuscripts for publication, proof, and all editorial matters should be addressed to the editors, 112 Agricultural Hall, University of California, Berkeley 4, California. All communications regarding non-receipt of numbers, changes of address, requests for sample copies, and all financial communications should be addressed to the treasurer, R. C. Miller, at the California Academy of Sciences, San Francisco 18, California.

Domestic and foreign subscriptions, $2.50 per year in advance. Price for single copies, 75 cents. Make checks payable to "Pan-Pacific Entomologist."

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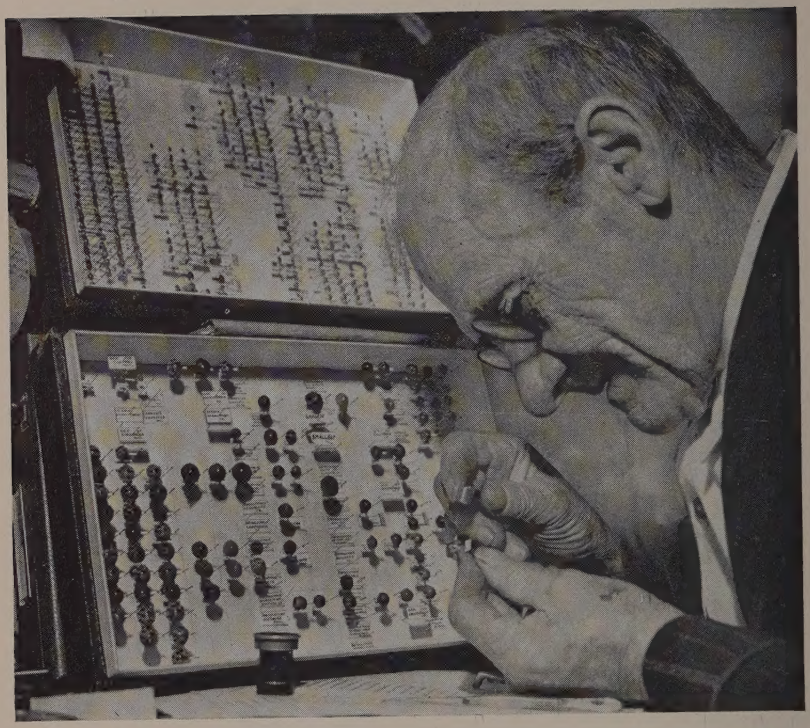

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FREDERICK WILLIAM NUNENMACHER

The Pan-Pacific Entomologist

Vol. XXIV, No. 1 January, 1948

BIOGRAPHY OF FREDERICK WILLIAM NUNENMACHER

BY E. R. LEACH
Piedmont, California

In the death of Frederick William Nunenmacher at his home in Piedmont, California, on April 29, 1946, the West lost a man who might be called the last of the old-time collectors, for like Douglas, Coulter, and Nuttall of old he collected over a large part of California on foot. Possessed of a strong and active body, an inquisitive mind, and remarkable eyesight, he was the ideal field collector and he pursued his hobby with a zeal and enthusiasm that made him an outstanding and picturesque character. Born in Oakland, California, March 28, 1870, when that city was but a village, he grew up surrounded by nature at its best. Open fields, oak groves, streams, bays, and marshes provided ideal homes for all forms of wild life; birds, reptiles, and insects abounded. In his boyhood he collected everything and became especially proficient in the preparation of bird skins. He had little schooling and when quite young began to help his father in his garden and nursery business—a line of work he continued to the end of his life. He thus lived out-of-doors and had amassed a large collection of miscellaneous natural history specimens by early manhood. At this time he had the good fortune to meet the eminent economic entomologist, Albert Koebele, who in a short time convinced him that he should concentrate on some small group in which he had a special interest. Following this advice he began at once to limit his collecting to Coleoptera, specializing on the Coccinellidae. In later life he became a strong advocate of specialization and also of the practice of keeping long series of each species instead of a pair or, at most, a set of four as was the custom of most of the older collectors. How well he succeeded in his own case is shown by the Coccinellid collection that he left—probably the most complete in America.

His early collecting was done in the San Francisco Bay area beginning in the 1880's. The first long trip of which there is a record was to Arizona in 1906 where he spent three months as assistant to his friend, Koebele. Nogales was their headquarters from which they scoured the country on foot for miles in all directions. While searching primarily for a parasite to prey on certain Homoptera, all orders of insects were taken when found. In 1907 and 1908 he was engaged in the nursery business in connection with a restaurant and hotel in Goldfield, Nevada. As may be imagined, this was not a profitable business financially, but his residence there proved very profitable entomologically.

While the Coccinellidae were his favorites in the laboratory, in the field he preferred the *Omus* and sought them with great energy and skill. The first date noted for taking this genus is 1892, but it was not until 18 years later that he began his systematic search for them—a search that was to influence most of his trips for the next 35 years. In this enterprise he was encouraged and assisted by Dr. Walther Horn, the well-known *Cicindela* specialist, with whom he had long and friendly relations. It was in 1910 then that he began his *Omus* quest by proceeding to the northern coast of California where he collected as he walked along the old country roads (far different from the present paved highways) from Eureka through Crescent City to Waldo, Oregon. In 1911 perhaps the most strenuous and difficult trip of his entire career was undertaken. Starting 50 miles south of Eureka he tramped along the roads collecting as usual through Arcata, Blue Lake, and Willow Creek to Cottage Grove on the Klamath River. From here it is 75 miles in an airline to Grant's Pass, Oregon, through some of the wildest and roughest mountains in either of the two states, and that was the route he chose to take. Alone with his collecting equipment on his back, he had only game trails to follow and was dependent on the Indians and an occasional prospector for his food and shelter. The distance actually walked between these two places could not have been less than 100 very rough miles and the total for the trip, 275. To appreciate the boldness of this venture, one must see this rugged wilderness himself.

His next journey of importance was in 1913 when with his son he took a horse and wagon and travelled up through Shasta and Modoc counties as far as Lakeview, Oregon, and back by way of Lassen and Plumas counties and Lake Tahoe—a productive trip

of three months duration. The next season, 1914, with the same companion and outfit, two months were spent in the region around Yosemite Valley. On both these trips the wagon was only for transporting their camp equipment. Almost the entire distance was made on foot in order to collect along the way, the horse being trained to follow. From 1910 when he began his intensive search to the end of this trip in 1914, he had collected 23 species of *Omus* described as new by Dr. Walther Horn and Col. Casey. In later years seven more species of *Omus* collected by him were described as new, four by himself. As the automobile came into use and good highways were built, many short collecting trips to various parts of this and adjoining states were taken, that in 1928 when a month was spent in Arizona being the longest.

On all his trips he worked long and hard. His voice was the first to be heard in the morning, "Come on, fellows—time to get started," and this always before daylight. As a result, he amassed an enormous amount of material, mostly Coleoptera, all of which had to be sorted, mounted, and classified at night and on Sundays as he carried on his nursery and garden work at all times. In this material there were naturally many rare and interesting species and a list prepared by him shows that various authors described 195 species as new of which 20 bear the specific, or varietal, name "nunenmacheri." At various times he sold or otherwise disposed of large parts of his collection. Even so he left 60,000 specimens of classified Coleoptera and a large amount of unclassified material. The Coccinellidae, comprising 2100 species and varieties and 15,000 specimens, was purchased in 1947 and presented to the California Academy of Sciences while practically all of the remainder is now in the Chicago Natural History Museum. Although he spent much time in the study of his beetles, especially Coccinellidae and *Omus*, his writings were rather meager, a few papers on these two groups and the description of a new *Zacotus* being all his published work. A short account of his experience in collecting *Omus* was left in manuscript.

While he took long trips alone and spent hours by himself in his "bug shop," he really was a very sociable person and enjoyed company, especially that of fellow collectors. Beginners were always welcome. Not only did he help them generously, but seemed able to imbue them with the intense enthusiasm that was his outstanding characteristic. His home life was a happy one, and he

raised a family of six children, of whom four daughters and his son survive. In addition to the cares of a family, conduct of his business, and the building of an insect collection, he found time to take part in many and varied activities. He was a charter member of the Pacific Coast Entomological Society, acted at times as a deputy sheriff, was for many years a volunteer fireman, and even served as a delegate to political conventions. He was also skilled in the building trades and built the house in which he lived almost entirely alone. He was brick mason, carpenter, plumber, plasterer, painter, and most everyone else needed to complete the job. For several years he was the city gardener of Piedmont and superintended the planting of most of the trees that now line its streets.

Such in short was the full, active, and useful life of Frederick William Nunenmacher. Who of us has made better use of his time and talent?

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13. 1948. Studies among the Coccinellidae, No. 11 (Coleoptera). Pan-Pac. Ent., XXIV, pp. 6-8.

Names of Species and Varieties Proposed by F. W. Nunenmacher

Cicindelidae

Omus subcylindricus, 9:143.

Omus vanlooi, 9:144.

Carabidae

Zacotus fredericki, 10:12.

Coccinellidae

Adalia nigromaculata, 6:20.
Agrabia sicardi, 4:448.
Agrabia sicardi var. complexa, 4:448.
Axion incompletus, 2:71.
Brachyacantha blaisdelli, 1:162.
Brachyacantha distincta, 13:8.
Brachyacantha lengi, 4:449.
Brachyacantha manni, 3:150.
Brachyacantha neglecta, 13:8.
Brumus blumi, 7:114.
Coccinella bridwelli, 5:76.
Coccinella humboldtensis, 4:448.
Coccinella ampla var. rufa, 11:146.
Coccinella vandykei, 1:161.
Ceratomegilla cottlei, 6:20.
Delphastes argentinicus, 8:183.
Exoplectra brasiliensis, 3:151.
Hippodamia hoppingi, 6:21.
Hippodamia apicalis tricolor, 12:72.
Hyperaspidius bryanti, 13:7.
Hyperaspidius carri, 13:6.
Hyperaspidius coloradensis, 13:7.
Hyperaspidius horni, 6:19.
Hyperaspidius juniperus, 11:145.
Hyperaspidius mexicanus, 6:19.
Hyperaspidius rossi, 11:145.
Hyperaspidius shauli, 11:145.
Hyperaspidius subtropicus, 13:7.
Hyperaspis biornatus, 6:18.
Hyperaspis falli, 4:450.
Hyperaspis lateralis var. flammula, 2:72.
Hyperaspis leachi, 6:19.
Hyperaspis idae, 4:450.
Hyperaspis ploribunda, 2:74.
Hyperaspis wellmani, 2:72.
Hyperaspis wolcotti, 2:73.
Microweisea ovata, 6:20.
Psyllobora koebelei, 2:71.
Scymnillus cochisiensis, 4:451.
Scymnus convexus, 8:182.
Scymnus maderi, new name for S. quercus Nun., 8:183.
Scymnus quercus, 6:18.
Scymnus schuberti, 6:17.
Scymnus scotti, 6:17.
Stethorus ogloblini, 8:182.
Zenora tricolor, 11:144.

STUDIES AMONG THE COCCINELLIDAE, NO. 11
(Coleoptera)

BY F. W. NUNENMACHER
Piedmont, California

G. R. Crotch, in April, 1873, erected his genus *Hyperaspidius* on the basis of the absence of an epileural fovea to receive the posterior femur, and listed *trimaculata* Linn. as the first species. Gorham (Biologia Centrali-Americana, page 204) says, in fact, that the foveae are perfectly apparent. Maj. Casey in his revision of the American Coccinellidae, page 130, says this is an aberrant genus of the present tribe, in having the elytral epipleurae devoid of depressions for the posterior femur, and he too puts *trimaculata* Linn. in that genus. On looking my two specimens over I find they have a distinct but shallow fovea and on this ground I am returning *trimaculata* to the genus *Hyperaspis* in my collection. *Hyperaspis trivittata* Ws. from Brazil has the same pattern as *trimaculata* Linn. and could be taken for a variety of it.

Hyperaspidius carri Nunenmacher, new species

Head of the male yellow, finely punctured; of the female black, finely punctured, with a narrow lateral border yellow. Elytra yellow, suture black, gradually dilated to about the middle, then narrowed to just before the apex; and a broad black vitta commencing on the callus and extending to about three-fourths the length of the elytron where it curves inward. In the male it does not join the suture but in the female it does. The margin bead is dark. Ventral surface of male piceous, the legs and epipleura yellow; of female black, the legs and epipleura yellow or darker. Length 2-2.5 mm., width 1-1.5 mm.

Holotype, male, allotype, female, and seven paratypes, MEDICINE HAT, ALTA., May 25, 1934, J. Carr collector. Seven paratypes, CYPRESS HILLS, ALTA., May 2, 1924, F. S. Carr collector. Types and three paratypes in the author's collection. Eleven paratypes in the O. Bryant collection. The specimens came to me labeled *vittigera* Lec., and were kindly given to me by O. Bryant.

Hyperaspidius coloradensis Nunenmacher, new species

Oval, somewhat depressed. Head black, finely punctured. Thorax black, sides very narrowly yellow, sparsely and finely punctured. Elytra yellow; suture narrowly and the same width to the apex black. A broad vitta covering the callus and extending nearly to the apex, where it curves inward and narrows to a point that just reaches the suture. This black vitta is twice the width of the yellow ground color. Ventral surface black, legs and epipleura piceous. Length 2 mm., width 1.5 mm.

Holotype female in the author's collection. COL.—No other data.

Hyperaspidius bryanti Nunenmacher. new species

Head yellow, occiput black and very finely punctured. Thorax yellow with the basal half black, notched in the center, the black not reaching side margins. Very finely punctured. Elytra light yellow with the suture narrowly and the same width to the apex, black. A broad black vitta covering the callus to three-fourths the length of the elytron where it curves inwards and outwards connecting with the suture, and the margin the same width leaving a large oval apical spot. Elytra punctured a little deeper than the thorax. Ventral surface piceous. Epipleura and legs yellow. Length 1.5 mm., width 1 mm.

Holotype, male, in the author's collection, ST. CATALINA MTS., ARIZ., June, 1940, Bryant (Lot 23) collector. One paratype, male, same data? Private label No. 263. No label in O. Bryant's collection. I name this pretty species for its discoverer.

Hyperaspidius subtropicus Nunenmacher. new species

Head of male yellow, very finely punctured; of female, black. Thorax of male finely punctured yellow with the base broadly black, anteriorly four lobed, and extending beyond the middle; of female, black with narrow yellow sides. Elytra punctured a little coarser than the thorax. Yellow suture narrowly black and a black vitta commencing on the callus and extending to a little beyond two-thirds the length of the elytron. Female the same. Ventral surface piceous. Legs and epipleura yellow. All the yellow is a light straw yellow. Length 2 mm., width 1.25 mm.

Holotype, male, and allotype, female, in the author's collection from MEXICO, October, 1907, A. Koebele collector. No other data. Kindly given to me in 1898 under the name *vittigera* Lec. by Mr. Koebele.

Brachyacantha distincta Nunenmacher, new species

Head black, finely and closely punctured. Thorax black, a little more clearly punctured, with broad yellow sides. Elytra black with a large irregular oblong shaped spot that covers most of anterior half of elytra. A large apical spot yellow, commencing at center of base where it is a little wider than half the width of elytron and extending parallel with the suture to a little beyond middle of length of elytron where it expands and almost joins the suture, and ends in a blunt point. Lateral margin starting at the base on inner side of callus and expanding a little just as it frees the callus, then on to about middle of length of elytron, ending in a rounded angle. Punctures a little stronger than on thorax. Apical spot large, round, leaving a narrow space as a suture. Apex and margin black. Ventral surface and legs rufescent except epipleura, meso-, and metasternum which are black. Length 4 mm., width 3 mm.

Holotype, female, in the author's collection from CORUMBA, MATT. GROSSO. No other data.

Brachyacantha neglecta Nunenmacher, new species

Head black, finely punctured. Trophi yellow. Thorax black, sides narrowly yellow and punctured a little stronger. Elytra black with a crude three-pointed star and two spots yellow. A small triangular humeral spot. A broad crescent-shaped spot in middle of elytron with rounded ends that do not reach the suture of the margin, leaving a narrow space black. A branch about half the width from center extending to the same side of scutellum forming star. Apical spot large, about the same distance from suture. Apex and margin punctured a little stronger. Ventral surface and legs black, tarsus rufescent. Epipleura black, yellow at humeral and marginal spots. Length 4 mm., width 3.25 mm.

Holotype, female, and one paratype, female, in author's collection from ETRE. RIOS. ARGENT. No other data.

OBITUARY NOTICE

Professor T. D. A. Cockerell died on the morning of January 26, 1948, at 430 Nutmeg Street, San Diego, California, at the age of 81 years, 5 months. Entomologists all over the world will be sorry to learn of his demise. He was working up to the very last on his bees. A more extensive obituary notice will appear in an early issue of the Pan-Pacific Entomologist.—E. O. ESSIG.

MOUNTING APHIDS AND OTHER SMALL INSECTS ON MICROSCOPIC SLIDES[1]

BY E. O. ESSIG
University of California, Berkeley

In order to systematically study many small insects such as aphids, thrips, and coccids, it is necessary to prepare the specimens so that they may be critically examined under high magnifications. Although unmounted or temporarily mounted specimens may be superficially investigated by means of a hand lens or a binocular microscope, a properly prepared and mounted specimen is required for the careful examination with a compound microscope necessary for exact determination of species and for morphological study. From earliest times, in the examination of these small insects, it has been a common practice to mount them directly into any available medium on a glass slide and covered with a very thin glass cover slip. Specimens so mounted may be preserved almost indefinitely against the inroads of time, moisture, corrosion, fungi, and predacious insects that so often destroy pinned and otherwise exposed insects.

Since 1909 I have been studying plant lice of the family Aphididae and have had occasion to examine many methods of preparing these rather delicate, soft-bodied insects for study both in America and in Europe and have also examined much mounted material received from systematists from all parts of the world. I do not know who first perfected the technique of the Canada balsam mount, but the earliest slides of aphids that I have examined were those prepared by Francis Walker which are in the British Museum of Natural History and are now approximately 100 years old. Although the balsam has darkened greatly, the specimens are still in fair condition for study with a compound microscope. Other early students of aphids mounted them on pins or on points and consequently most of the specimens of species described before Walker's time have been lost. Thus the innumerable species described by Linnaeus, Fabricius, Kaltenbach, Schrank, Koch, Geoffroy, De

[1]These recommendations and procedures are also applicable to Acarina and to other small insects, including the Apterygota, Coccidae, Anoplura, Mallophaga, Thysanoptera, etc.

Geer, and other contemporaries in Europe and those of Harris, Fitch, Walsh, Rafinesque, Haldeman, Ashmead, and others in America, have mostly disappeared and there are no specimens such as types or cotypes left to guide their successors.

During recent years, most systematists have mounted aphids in the accepted manner on glass slides directly into balsam or euparal. Certain more exacting and careful workers have also cleared the specimens by cold or hot treatment in a water solution of KOH or NaOH followed by staining and preparatory to mounting in media.

Aphids are somewhat more difficult to clear than most other small insects because of the embryos which should be removed from the bodies of the females before a satisfactory transparent and stained mount can be secured. The embryos, if not removed, may completely fill the body cavity and obscure many of the important details necessary for the correct determination of the species. Staining of the embryos within the bodies results in an opaque mass of little use to the systematist. Staining may also obscure much of the pigmentation so useful in classification.

In order to improve the technique in the preparation of more satisfactory and permanent mounted specimens of aphids, a careful study was begun at the British Museum of Natural History, London, in the fall of 1936, and from there continued in Belgium, Holland, Switzerland, Austria, Germany, France, and the United States up to the present time. The results of the studies are also based upon the experience of many aphidologists.

I. Preservation of Specimens for Permanence or for Subsequent Mounting

1. Living or freshly collected specimens

The most easily prepared and satisfactory mounts are from freshly collected living specimens. They may be removed from the host plants and killed in 95 per cent ethyl alcohol. This solution also thoroughly wets the bodies and wings and prevents the latter from sticking together, becoming misshapen, and from collecting air bubbles. They are then transferred immediately to the clearing solution.

2. Specimens preserved in liquids

(1) *In alcohol.* A solution of 70 to 95 per cent ethyl alcohol is very satisfactory for temporary or permanent preservation of

aphids. Specimens remaining in such concentrations for twenty or more years may be satisfactorily cleared for mounting.

(2) *In formalin.* Specimens preserved for many years in this fluid become hardened and are very much more difficult to clear and mount than those preserved in alcohol. If first soaked for 48 hours or more or heated in water, they may yield satisfactory specimens. Formalin is not recommended as a preservative for aphids.

(3) *In lactic acid.* A solution made up of 35 per cent lactic acid, 50 per cent alcohol, and 15 per cent water is a very satisfactory preservative for a short period of time, not much over a month. This preservative does act as a clearing medium but even so the embryos should be removed before mounting if the specimens are to be stained. A longer period in the preservative may cause the specimens to distintegrate and to become very difficult or impossible to mount.

3. Dried specimens

Aphids that have been dried may be treated in the same way as alcoholic or fresh specimens. Aphids preserved on herbarium specimens may be recovered if care is taken to remove the fragile insects in their entirety. Thus dried bodies on herbarium specimens preserved dry for over 100 years were successfully removed and mounted. Frequently bottled alcohol specimens dry up because of leakage around stoppers. Such specimens may be treated in the regular manner and usually clear up perfectly, seldom requiring the removal of body contents.

II. Clearing Specimens Preparatory to Permanent Mounting on Glass Microscopic Slides

There have been many methods proposed and used for mounting aphids on slides. The experience, technique, and objective of an aphid specialist has a great deal to do with the results obtained. Since specially prepared specimens are so much better for study than those simply dropped into a mounting medium, it is unnecessary to repeat the simple methods of the past.

Caustic Treatment (*KOH or NaOH*). Many aphidologists prefer to use these alkali chemicals for clearing aphids. It is the usual practice to make up a stock solution of 5 or 10 per cent for use as needed. It is now possible to procure gram pellets which are much more satisfactory, as small quantities may be readily prepared by adding a pellet or two as needed. All the difficulties occasioned by stock bottles of these solutions are eliminated.

There seems to be a growing preference for NaOH because it does not appear to be so destructive as KOH to the pigments and to the integument of these fragile insects. Both of these chemicals are also very destructive to the delicate wings of aphids and often render them unfit for mounting and study.

1. *Cold Solution.* The specimens are placed in a small container; vial, watch crystal or slender dish—completely immersed in a solution of the caustic clearing agent and put aside until the desired transparency is secured. From a few days to a week or even more time may be required. Specimens so treated frequently become very pale or completely transparent and even destroyed if left too long.

2. *Hot Solution.* By heating or boiling the specimens in the caustic solution the process of clearing may be reduced to a few seconds or minutes. Boiling is often quite injurious to the specimens unless carefully done. For aphids it is not to be recommended except for preserved species belonging to the dark forms of such genera as *Astegopteryx*, *Thoracaphis* and *Aleurodaphis*.

3. *Washing and staining.*

(1). Removing body contents. When the specimens are sufficiently cleared the embryos may be removed by using a suitable teasing instrument (Fig. 1) constructed by heating, flattening, and shaping a large steel needle point. Because of the delicacy of the treated tissues of the specimens it is often difficult to squeeze and tease out the embryos because the bodies collapse and prevent the "bellows action" that may operate to free the embryos from the body. Males and immature females usually clear without the necessity of removing the body contents.

In clearing, the wings often swell up like bags and are so fragile that great care must be exercised to deflate them without destroying them completely.

(2). Staining. After clearing, the specimens are removed to a clean container with water, acetic acid, or a suitable stain. Ordinarily, basic fuchsin or magenta is satisfactory, but fast green or other stains may be employed. NaOH-fuchsin may also be used, whereby staining and clearing may be accomplished at the same time. This step is followed by removal of the specimens to glacial acetic acid.

(3). Dehydrating. The third step is to remove any water and excess acid and stain by transferring to 95 per cent alcohol.

(4). Destaining. If the specimens are stained too densely the excess color may often be removed by transferring to water. Care is taken to remove just the right amount of stain. The aphids are then returned to alcohol. Ordinarily 95 per cent alcohol is adequate for satisfactory dehydration.

(5). Fixing and Clearing. The brilliance of the specimens is often improved by transferring them from the alcohol to clove oil, xylol, or a similar reagent. Ordinarily one may simply add a small quantity of clove oil to the specimens already in alcohol. Small globules of fat or soapy material may also be removed by the addition of a small amount of xylol.

Chloral Hydrate, Alcohol, Lactic Acid, Carbolic Acid, and Water Clearing Mixture

A solution of these components appears to have originated among aphidologists in Holland and has come to be generally used. The formula and procedure are as follows:

(1) Place preserved or live specimens in 70 per cent alcohol and heat over a boiling water bath for 10 to 15 minutes.

(2). Transfer to a solution of 70 per cent lactic acid and similarly heat for 15 to 20 minutes. (Small pale whitish or yellowish species for only 10 minutes).

(3). Transfer to a mixture of a saturated solution of chloral hydrate, to which a small amount of carbolic acid crystals are added, and heat over a hot water bath for only a few minutes or until the color is greatly lessened or disappears.

(4). Remove the body contents—especially the embryos.

(5). Mount directly into Berlese mixture, a modification of De Fauer's Fluid, or into a similar medium on the slide without washing or further treatment.

(6). Heat lightly for 10 or 15 minutes to relax the specimens but not to give rise to bubbles or air pockets under the cover slip.

(7). After a week or more, clean slide and ring with suitable ringing compound discussed further on.

Chloral hydrate and lactic acid both have a tendency to destroy aphid tissues very slowly and for that reason it is necessary to remove these chemicals by washing thoroughly and dehydrating in 95% alcohol followed by clearing in clove oil or similar oil *before mounting them in a more permanent medium such as balsam, euparal and dammar.*

Lactic Acid, Alcohol, Carbolic Acid, and Water Clearing Mixture

(1). *Formulation.* By far the simplest and most satisfactory solution for clearing aphids is one prepared as follows:

Stock Solution

Lactic acid	45 parts
Acetic acid	5 parts
Ethyl alcohol	30 parts
Water saturated solution of phenol	5 parts
Water	15 parts

This formula may be modified somewhat by adding more lactic acid or water to specimens long preserved in 80-95 per cent alcohol.

(2). *Heating.* Small stender dishes, 1¼ inches in diameter, are very suitable containers for handling the aphids during the clearing, heating and staining processes. A good procedure is to empty the aphids from the preservative directly into the dishes, draw off excess alcohol with a pipette and add the clearing solution. Appropriate labels may be attached to the covers. The covered dishes are then put into petri dishes and placed in a constant temperature oven and maintained at a temperature of approximately 120° F. or 49° C.

Freshly collected specimens may be heated sufficiently in one hour, whereas alcoholic specimens of long standing require from 24 to 48 hours or even longer. There is considerable difference in the relaxing and clearing of different species of aphids by this process. The most difficult specimens to clear are certain dark species of the genus *Aphis* which have long been in alcohol. The proper amount of heating may be determined by the clear appearance of the bodies and by actual testing of a few individuals. It may often be necessary to return inadequately cleared specimens to the oven for further heating. Injury by overheating has not been noted.

In developing this process the cleared specimens are removed from the lactic acid solution, the body contents and especially its embryos removed, transferred to 95 per cent alcohol, then to clove oil and finally mounted in the desired medium.

Dried specimens, alcoholic females devoid of embryos, and males, require no other treatment, but females which are full of embryos or eggs require special attention to remove these from

the bodies. To do this the aphids taken from the oven are transferred to the more accessible syracuse watch crystals and the embryos or eggs removed by special "teasers" under a binocular microscope. These teasers (Fig. 1) are of various sizes designed to just cover the entire body of the victim to be operated upon. Pressure from above disrupts the body wall at different points—usually along the sides—and the embryos are forced out by a carefully directed up and down bellows-like motion with just enough pressure to remove the embryos and other body contents without injuring or removing the legs, antennae, and wings. It is not always possible to secure absolutely perfect specimens from poorly preserved material and from fragile or very delicate species, but with care and patience very perfect and beautiful mounts may be secured. Freshly collected specimens yield the most perfect mounts.

When spread, these deflated skins do not assume the exact body contours of the living specimens but they permit the most discriminate and painstaking study of all the body characters that are important in determining the identity of the species. The pigmentation, sculpturing, vestiture, and other characteristics are preserved perfectly and can be reproduced by drawings and by microphotography.

Cleared specimens appear to vary considerably as to their rigidity following the various steps leading to their final immersion in the mounting medium. If not properly dehydrated and hardened during the last step, the antennae and legs often collapse when transferred to the mounting medium. This shrinking is caused by the sudden difference in the osmotic pressure between the lighter body impregnating fluids and the heavier mounting medium. Clove oil, xylol, and similar fixing solutions harden the tissues so that this collapse may be lessened or prevented. Apparently the effects of the preservative may be responsible for a hardening or softening of the body and appendages. Or perhaps the fact that newly molted specimens had not sufficiently hardened before they were collected and treated may result in their collapse more readily than the older and more mature individuals.

III. Mounting—General

Insect collections should be prepared for permanence. It has already been noted that the ordinary methods of pin and point mounting of such small and fragile insects as aphids are very temporary and useless for collection and museum purposes.

Slide mounts are not always satisfactory over a long period of time unless careful preparation and the most permanent types of mounting media are employed. At the present time there is no way of knowing what particular kinds and combinations of chemicals will prove the most satisfactory for these purposes over a period of hundreds of years. Perhaps we cannot expect such enduring qualities of a medium that must be so easily manipulated and perfectly adapted to all the requirements of a satisfactory mount that may be subjected to study by a high-powered microscope or the even higher magnification of an electron microscope.

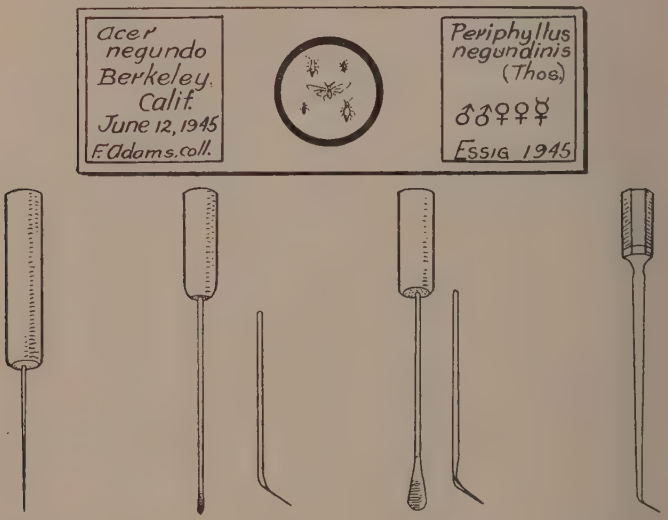

Fig. 1. *Top.* Glass microscope slide showing arrangement of aphid specimens, the ringed cover slip and suitable method of labeling. *Bottom.* Needle point and angled "teasers" used for the removal of the embryos and other body contents of the aphids. A large assortment of sizes may be desirable. The handles may be as long as needed. Natural size. (Drawing by Frieda Abernathy.)

(1). **Canada Balsam** has long been the most versatile mounting medium for small insects. Its important qualities are: (1) ease of manipulation; (2) ability to give up bubbles and air pockets; (3) refractive qualities; its index of refraction being 1.535;

(4) stability and durability; and (5) cheapness and availability. Some of the objectionable qualities are: (1) brittleness and tendency to dry out and crystallize over a period of years: this condition may often be temporarily corrected by adding xylol to the mount; (2) tendency to discoloration. Clear white balsam mounts prepared 20 to 30 years ago have become darker around the periphery under the cover glass. This darkening is gradually extending inwardly—a condition which might have been prevented by ringing with a suitable ringing compound. Unfortunately such of the old ringing materials as Brunswick black and white lead compounds proved to be quite unsatisfactory for such purposes.

(2). Euparal. This is a synthetic mounting medium composed of camsal, eucalyptol, pyraldehyde, and sandarac, which was first made available in the United States about 1927. It was accepted with some hesitation and much misgiving by most entomologists. Its cost was about eight times that of Canada balsam and this prohibited its extensive use in teaching and general laboratory work. Its durability has not yet been proven by actual use over a long period of time. However, it was soon adopted by many discriminating biologists and at the outbreak of the last great war in 1942, it had become a stable laboratory essential. Its importation from England and from Germany, where it was commercially formulated, was cut off during the war and the supply completely gave out in most places. Just now it is being sent over to this country from England and is being offered at the announced price of 23 dollars per pound. Only small deliveries have been forthcoming. As a substitute I have been using a local "Wherle" Euparal mixture which appears so far to be quite satisfactory. It has a tendency to darken somewhat or turn greenish in bulk, but the thin layer under a cover slip has remained colorless and clear over a period of four years. It has a refractive index of 1.483. Euparal is also marketed under the name Diaphane at $7.50 per pound.

Specimens may be transferred into Euparal directly from 95% alcohol or from a mixture of 95% alcohol with a small amount of xylol, oil of cloves, oil or Bergamot or other clearing agent. Like Canada balsam, Euparal readily gives up air bubbles. It sets quickly and apparently does not crystallize.

(3). Berlese Mounting Medium (A Modification of De Fauer's Fluid). As now formulated, this appears to be a satisfactory mounting solution. There are many modifications and formulations in use and all of them apparently give satisfactory

results for those who have devised them. A good formula is as follows:

Distilled water	20 cc.
Chloral hydrate	160 gr.
Gum arabic	15 gr.
Glucose syrup	10 cc.
Acetic acid	5 cc.

These ingredients may be formulated in the order listed over a hot water bath or in an oven at 50° C or 123° F. The resulting fluid should be filtered through a Buchner funnel and suction pump, or through Whatman No. 5 filter paper, or clarified in a centrifuge. It has a refraction index of about 1.461.

Specimens of aphids may be taken directly from water, alcohol or 10% acetic acid in distilled water. It is also possible, and often advisable, to mount living specimens directly into the medium after wetting them in alcohol to eliminate air bubbles.

After mounting, the slides may be heated for a short time over a hot plate or in an oven at about 120° F. This treatment relaxes and somewhat expands the specimens and promotes rapid clearing. It also seals the cover glass. Care must be taken to prevent the formation of bubbles.

After a period of two to four weeks the slide preparation should be ringed with a suitable ringing compound, as listed further on.

(4). Dammar. This is a resin derived from Australian conifers formerly of the genus *Dammara* (now *Agathis*). Refined to a colorless mounting medium, it has the excellent qualities of balsam and Euparal for which it is a satisfactory substitute. It has an index of 1.520 and appears to remain perfectly clear under the cover slip although it may cloud some in bulk. Specimens are prepared as for mounting in balsam or Euparal.

(5). Polyvinyl Alcohol. This is a relatively new mounting medium recently developed. The methods of formulation vary considerably which indicates that exact proportions of the various ingredients are not too important.

The recommendations for preparing the mounting medium with polyvinyl alcohol grade RH-349-N by the manufacturers, E. I. DuPont de Nemours & Company, Inc., are as follows:

A.—PVA Stock Solution:

To 80 cc of distilled water add PVA in small amounts until the mixture has the consistency of a thick syrup and attains a

volume of approximately 100 cc. Heat in a water or steam bath until homogeneous and milky in appearance. Allow to cool. Reheat to produce a clear mixture. Cool. Strain through fine copper gauze. (Some investigators recommend filtering the hot solution through 4 or 5 layers of filter paper.)

B.—PVA Stock Mounting Medium:

PVA Stock solution	56 cc.
Phenol crystals	22 grms.
Lactic acid (C.P.)	22 cc.
Picric acid (for staining)	1 grain.

Mount specimens into PVA directly from 95 per cent alcohol or from water in the regular manner, being careful to eliminate as many bubbles as possible. This will require some practice and experience. Fresh or preserved aphids may be wet in alcohol and then immersed in water and mounted directly into PVA without clearing or removing the embryos or body contents, but these specimens are not nearly as satisfactory for microscopic study as those properly cleared and stained.

After several days or weeks the excess PVA may be removed with a damp cloth and the slides ringed in the ordinary manner.

(6). Clarite and similar synthetic compounds:

The new plastic material, Clarite, makes a very good mounting medium for aphids and other insects. The specimens, after clearing in a proper solution and dehydrating in alcohol, may be transferred to xylol, toluene, or clove oil and thence directly into clarite. It is very important to have just the right consistency of the medium for eliminating bubbles. A 60 per cent solution of clarite in toluene, by weight, appears to give the most satisfactory results for aphids. The solution may be thinned with toluene, 1° C or 2° C grades. It is nearly water white and has a refractive index of 1.544 and a melting point of 145° to 150° C.

IV. Cover Slips

Circular cover slips are preferable to squares because they can be ringed with a cement that protects the mounting medium from desiccation, discoloration and possible crystallization. If temporary mounts only are desired, there is no need to go to the additional trouble of attempting to use permanent mounting media or for ringing the slides. But for collections, and especially for

types of all kinds, it is most desirable to produce as permanent mounts as possible. For such mounts, ringing the cover slips to seal the mounting medium may be an important factor. (Fig. 1.) The ringing may be repeated from time to time, every 10 or 20 years if required.

V. Ringing Compounds

Slide ringing has been practiced for many years by botanists, plant pathologists, nematologists, and a few entomologists. Brunswick Black or alphabet varnish, Japan gold size, zinc white, and other materials were used, but without very satisfactory results.

Materials that are now available and very much better for ringing are:

(1). *Murrayite.* An English product used mostly for sealing jars and vials containing specimens preserved in alcohol. It is a clear light brown compound soluble in xylol and similar solvents that is easily applied, quick-drying, and thoroughly satisfactory for ringing slides.

(2). *Thorne ringing compound.* This new material was evolved by Gerald Thorne, nematologist, Bureau of Plant Industry, U. S. Department of Agriculture, in 1935 for ringing cover slips for nematodes mounted in a glycerine medium. The formulation is:

Nitrocellulose solution	2 parts
A. D. M-100 (a polymerized linseed oil product used in the paint trade)	1 part
Thinners—Butyl acetate or acetone	

The material is transparent and may be colored to suit the user. A small amount of an oil soluble red pigment is used by the originator and others. Its sale is at present somewhat restricted but it will no doubt be made readily available in the near future. It is a very valuable addition to ringing compounds and is apparently suitable for many purposes. It is very satisfactory and quite inexpensive.

VI. Labels and Labeling

The proper mounting of small and minute insects on glass microscopic slides is one of the most permanent methods for the preservation of insects. Therefore, great care should be taken to insure equal permanence of the essential data that should accompany the specimens.

This data may be scratched on by a diamond, but the results are not altogether satisfactory because it is difficult to scratch the letters distinctly and the finished inscriptions are trying to read.

Gummed paper labels prepared commercially are generally used. Unfortunately in most labels neither the paper nor the adhesive have lasting qualities. Labels of slides prepared ten or twenty years ago are now in bad shape. They may have so deteriorated as to be either falling to pieces or so discolored as to be illegible. The adhesive may also have disintegrated. The ink often used was frequently not permanent and may have faded. The labels of slides prepared in 1909-1920, and even later, have recently been specially treated to prevent further disintegration. Most labels are carelessly and poorly applied with only portions properly and entirely stuck to the glass slides. Handling has caused the edges to roll up and tear off and eventually the writing has become so defaced as to be unsightly and illegible.

For permanency, slide labels should be made of thin linen or rag paper gummed with the best adhesive. A large series of labels may be outlined on a sheet of paper from which a permanent zinc block may be made. Any good job printer is able to furnish the label paper stock, have it gummed, and do the printing. Such sheets of labels are handily stored, easily cut, and suitable to write on with permanent India ink.

To apply labels to slides. Labels should be applied one at each end of the slide. They may be handled by forceps, dipping a single one wholly in water and applying it directly to the slide. A clean blotter beneath the slide and another to press down the label and to absorb the excess moisture around the edges aids in the process. With only a small amount of care the labels are soon placed squarely and tightly to the slide. With the blank labels in place it is very easy to center the specimens when mounting. The right-hand label is for the name of the insect and the left-hand one is for the name of the host plant, the locality, date and name of collector. This label is permanent, whereas the right-hand label may be changed with the scientific name of the insect.

VII. Mounting—Finished Slide

One or more properly cleared specimens are placed in the medium on the slide and after each specimen is carefully spread, with all the appendages properly arranged, the cover slip is applied as nearly horizontally as possible and carefully directed over the

specimens. The slides are placed in flat trays for drying. Labeling may be done with a croquill pen and India ink.

After the medium is thoroughly dry—2 to 4 weeks—the overflow may be removed around the edges of the cover slip with a safety razor blade or scalpel and the slide is then ready for ringing.

(1). *Ringing.* Ringing is accomplished by the use of a ringing table available from scientific supply houses. A No. "O" sable hair brush is most desirable for applying the ringing compound.

(2). *Protecting the labels.* The written labels may be protected from wear and weathering by applying two coats of dammar or other varnish.

This treatment also fastens the labels permanently to the slides and prevents wear, tear, and smearing. Old labels that have begun to darken and decay may be saved by varnishing.

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THE SCARABAEID GENUS GEOTRUPES AND ITS TYPE
(Coleoptera)

BY ROBERT W. L. POTTS
California State Department of Agriculture
San Francisco

In checking early references to *Geotrupes* for a proposed general paper on the genus it quickly appeared that the present use of the name is questionable. Important references and the facts are as follows, along with my personal interpretations and conclusions:

1796. Latreille (Prèc. Car. gén. Ins., p. 6) proposed the generic name *Geotrupes* as new, with the following description: "Antennes de onze articles. Lèvre supérieure avancée. Mandibules fortes. Lèvre inférieure à deux divisions alongées. C. H. Chaperon rhomboidal. Ecusson. Jambes antérieures dentelées." There were no species names, descriptions, nor bibliographic references to species included with this description.

1798. Fabricius (Suppl. Ent. Syst., p. A, pp. 7-22) under the name *Geotrupes* gave a description of the genus that does not at all parallel that of Latreille, and listed 63 species, most of which are now placed in the Dynastinae, with only 5 belonging in the present Geotrupinae, one of these being *dispar*. Elsewhere (pp. 2, 23-24) species are listed under the name *Scarabaeus* which are now considered to be *Geotrupes*.

1801. Fabricius (Syst. Eleuth., pp. 2-26) adds further species to both *Geotrupes* and *Scarabaeus*, still preserving his concept of the two genera.

1802.* Latreille (Hist. Nat. Crust. Ins. ed. 1802) lists two species under the name *Geotrupes*, in order, *stercorarius* and *vernalis*.

1804. Latreille (Hist. Nat. Crust. Ins., 10:142-147) lists *dispar*, *typhoeus*, *mobilicornis*, *stercorarius*, *sylvaticus*, and *vernalis* in the genus *Geotrupes*. In his introduction to the genus he says: "J'avois posé les bases de ce genre dans mon ouvrage intitulé (Prècis des caractères génériques des Insectes), ou, pour parler plus vrais, je n'avois fait que donner un denomination à la seconde coup des scarabees d'Olivier, car ce naturaliste avait exposé tous les caractères de ce genre avant moi. Fabricius, en adoptant ce travail, a fait malheureusement une transposition de noms; mes scarabées sont devenus des gèotrupes, et mes gèotrupes, des

*I have not personally checked this reference, but accept it on the authority of Arrow (personal letter).

scarabées. Ce changement n'etant pas fondé, on me permettre de n'y avoir pas égard."*

There is no question of responsibility for the name *Geotrupes*, as Opinion 46 of the International Code states, "If an author clearly shows that the name he proposed is to be applied in a generic sense . . . the name in question becomes available under the Code . . . although he may have failed to name the species." While Latreille did so fail, he clearly indicated that the name was new, and that it was to be applied in a generic sense.

We are next faced with the problem of the genotype, since Latreille forfeited his first opportunity to state what species belonged in his new genus.

Opinion 46 also states, "In numerous instances authors have proposed new genera, but have failed to mention by name any species . . . " These cases are then divided into several general categories, of which the 5th group is clearly the one applicable to the present case: "(5) and there are instances in which an author has described a genus, clearly giving generic characters, but . . . from the original publication it is not clear how many species (none of which he mentioned by name) were included in the genus. Each new genus therefore, contains all of the species of the world which come in that category in the tables; . . . if at the second, third, or tenth publication one or more species are mentioned, those are the only species which become available as type, and if only one were mentioned this would be the type. In other words, in genera belonging to the fifth category, the first species published as member or members of the genus are the only species available as type."

Fabricius, in 1798, was the second to use the name *Geotrupes*, and under ordinary circumstances, would be considered the "first reviewer." However, it may be argued that his is an altogether different genus, since his description does not coincide with that of Latreille. Nevertheless, among the heterogeneous mixture of species he included there is one, *dispar*, which fits Latreille's description with the questionable exception that a clypeal horn obscures the basically rhomboidal nature of the clypeus. Ignore the horn and this character, too, checks perfectly. Indeed, Latreille

*A free translation runs: "I have proposed the basis for this genus in my work entitled *Prècis des caractères génériques des Insectes*, or, to be more precise, I have only given a name to the second group of scarabs of Olivier, since this naturalist has pointed out all the characters of the genus before me. Fabricius, in adopting this work, has unhappily made a transposition of names; my scarabs are become his geotrupids, and my geotrupids his scarabs. This change is without foundation, permitting me to entirely ignore it."

himself heads his 1804 list with *dispar*. Jekel, in his 1865(1866) monograph of *Geotrupes* names *dispar* as the genotype of the subgenus *Ceratophyus*, a subgenus now usually accorded the status of a genus.* Arrow, in reviewing the Fabricius list at my request says, " . . . the nearest to *Geotrupes* in the true sense is *dispar*, now called *Ceratophyus*."

However, let us first consider the two alternative suggestions that can be made: (1) that Fabricius' use of *Geotrupes* and *Scarabaeus*, as suggested by Latreille, was a transposition, a *lapsus calami*. In consequence, his names should be straightened out, and one of his species under *Scarabaeus*, since they will fit Latreille's description, must become the genotype, and *stercorarius* is not among the seven species there listed. So this, too, would require a change. It seems to me that a *lapsus calami* is highly improbable. Fabricius cites both *Geotrupes* and *Scarabaeus* in two different places in 1798 and reuses them both, in the same sense, in 1801. An inadvertent error should undoubtedly have been noticed when so often repeated.

Or, (2), Fabricius published his 1798 *Geotrupes* without knowledge of Latreille's use of the name, intending it as a new genus. In such a case the name would fall as a homonym, and he has been anticipated in his restriction of the genus *Scarabaeus*. Consequently the *Geotrupes* of Latreille is unaffected and the second publication of the genus, under the Code, is in 1802, and Latreille was within the Code in his selection of *stercorarius* as his genotype in 1810. While this is a simple, and possible solution, it also seems highly improbable even though our present use of *stercorarius* as the type tacitly implies that this explanation has been followed ever since Latreille's 1804 and 1810 publications. However, Fabricius did not indicate that his use of *Geotrupes* was new nor did he indicate a typical species as he occasionally did with his new genera, and as he did with other valid new genera in the same publications. While personal opinions in such a case as this are probably valueless, I cannot believe that Fabricius worked in ignorance of Latreille any more than Latreille worked in ignorance of Fabricius. Furthermore, the burden of proof should be to the effect that Fabricius intended his name as new and I can find no such proof whatever.

And finally, both these alternatives hinge upon our ability to interpret the intent of a worker long dead, who never explained

*That *dispar* has been used as a genotype does not eliminate it from consideration. See Article 62 of the Code, which specifically applies to this point.

his intentions in this case. The only pertinent information we have, from Latreille's 1804 publication, must be considered as both prejudiced and ambiguous since it presumes a *lapsus calami*, but treats as though a homonym had been created.

If neither of these alternatives is acceptable, and I believe they are not, then the citation of an acceptable species, *dispar*, in the 1798 publication of *Geotrupes* must stand. This species becomes the genotype by monotypy, and Latreille's 1810 selection of *stercorarius* is irrelevant.

Therefore *Ceratophyus* must fall as a synonym of *Geotrupes*, and that genus, or subgenus, of which *stercorarius* is the type is left nameless.

While this maintains the subfamily Geotrupinae in its present sense it does considerable violence to our concept of *Geotrupes*, a concept based on *stercorarius* as the type, a concept which has now held for almost a hundred and fifty years, a concept which is clearly the same as that originally held by Olivier and given a generic name by Latreille.

Since it appears impossible to maintain our century and a half old concept of *Geotrupes* under the Rules, I am submitting the matter to the International Commission, with the recommendation that, under their plenary powers the rules be set aside in the case of *Geotrupes*, and that *stercorarius* be declared its official type.

Should the Commission rule against this petition, then will be ample time to propose a new name for the genus, or subgenus of which *stercorarius* is the type.

NEW RECORDS OF PONERA TRIGONA VAR. OPACIOR FOREL

(Hymenoptera: Formicidae)

Since this primitive ant has been recorded previously from only two California localities, the following collections are of considerable interest: found in moist soil, Sigmund Stern Grove, San Francisco, February 25, 1946, Potts and Ting colls. (8 workers in the author's collection); Sacramento, October 16, 1941, Bachman coll. (3 winged females, in the collection of the State Department of Agriculture); Pinon Flat, San Jacinto Mountains, May 27, 1939, Ross coll. (2 workers, in the University of California collection). In connection with the previous records, from Bakersfield and Weed, it would appear that this ponerine species is widely distributed if not common within California.—ROBERT W. L. POTTS.

LIPONYSSUS PACIFICUS EWING, A SYNONYM OF *LIPONYSSUS SYLVIARUM* (CANESTRINI AND FANZAGO)

(Acarina: Dermanyssidae)

BY DEANE P. FURMAN
University of California

A study of series of specimens of *Liponyssus sylviarum* (Cn. and Fanzago) taken from various species of birds in California, has revealed variations within series ranging from typical to decidedly atypical specimens.

Since certain of the more atypical specimens seemed to approach very closely the description of *Liponyssus pacificus* Ewing, specimens were sent for verification to Dr. E. W. Baker at the U. S. National Museum. He stated that two of the most atypical specimens collected from a Brewers blackbird, agreed upon comparison with the types of *Liponyssus pacificus*. Appreciation is expressed to the virology section of the Hooper Foundation for Medical Research for the loan of avian mites during this study.

Comparison of pacificus with sylviarum

The anal plate of *L. pacificus*, as illustrated by Ewing (1922), has a truncate posterior margin. In the type series of this species as well as in many specimens of *L. sylviarum* examined, the terminal portion of the anal plate is abruptly folded under, and only upon careful observation is it possible to ascertain that the plate actually has a tapering, rather acutely rounded posterior margin.

The position of the paired anal setae of *L. sylviarum* varies. Usually they are behind the level of the middle of the anus, but on some they may occur at the mid level or even anterior to the mid level of the anus.

Typically, females of *L. sylviarum* have a sternal plate bearing two pairs of setae, with a third pair located just off the plate and postero-lateral to it. This arrangement is not constant, however, for the postero-lateral corners of the plate may approach and in some cases appear to include the third pair of setae. In the type series of *L. pacificus* the lateral branches of the sternal plate are cut off either at or slightly before the third pair of setae and do not extend between the coxae as illustrated by Ewing (1922). Furthermore, the anterior pair of setae of the types may be on the edge of the plate or slightly behind it, agreeing with the variations found in *L. sylviarum*.

The peritreme extends anteriorly a variable distance in *L. sylviarum*, ranging from the level of the second coxae to a point anterior to the posterior margin of the first coxae.

It appears thus that the original description of *L. pacificus* as differentiated from *L. sylviarum* is based on a combination of variable characters and artifacts in the type series, and therefore it is considered a synonym of *L. sylviarum*.

A number of specimens collected from a chipmunk (*Eutamias alpinus* Merriam) were reported by G. Auguston (1941) as *L. pacificus*. These specimens definitely are different from the type series of *Liponyssus pacificus*.

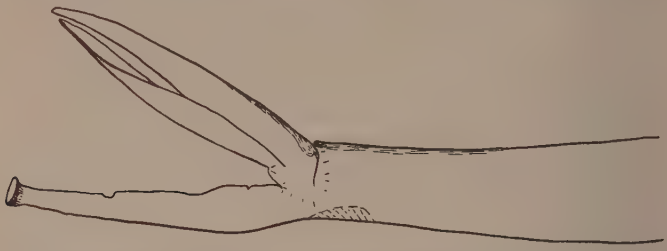

Fig. 1. Chelicera of *Liponyssus sylviarum* (Canestrini and Fanzago)

In connection with the current study of *L. sylviarum*, details of the cheliceral structure were observed, which so far as I am aware have not been reported previously. As shown by the accompanying figure, the movable arm is divided for part of its length into two processes, or phalanges. Proper orientation is necessary to observe this structure to best advantage, but it is visible even on poorly mounted specimens if examined carefully under an oil immersion lens.

The fixed arm of the chelicera is slightly longer than the movable arm and possesses a slightly flared tip which is set at a right angle to the axis of the arm.

It is possible that the cheliceral structure of *Liponyssus sylviarum* warrants its removal from the genus *Liponyssus*. My observations have not revealed a similar morphology in other species of the genus. Pending more extensive investigation, however, it is best to retain the species in its present status.

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CLINODIPLOSIS PUCCINIAE, A NEW GALL MIDGE FEEDING ON A RUST

(Diptera: Itonididae)

BY A. EARL PRITCHARD
University of California, Berkeley

A number of species of gall midges have been assigned to the genus *Clinodiplosis* Kieffer. The larvae of most of these have been regarded as inquilines, inasmuch as they are commonly found in association with gall midges, gall wasps, or stem-mining caterpillars. Species which are currently placed in closely related genera are principally fungus feeders or predators in the larval state. Of the four species of *Clinodiplosis* known from North America, one has been reared from the stems of Iceland poppies, while adults of the other three species were collected from spider webs. The following new species is of particular interest because the larvae are found in galls which are formed by the rust, *Puccinia evadens* Hark., on chaparral broom, *Baccharis pilularis* DC. Studies on the biology of this midge will be presented by Mr. John M. Harvey, of Stanford University, in a subsequent publication. The writer is indebted to Mr. J. W. Tilden, also of Stanford University, for the type material.

Clinodiplosis pucciniae Pritchard, new species

A pale yellowish species with three wide, sharply defined, dark brown mesonotal vittae. Eyes large, covering head dorsally and laterally. Palpus four segmented, the proximal segment short, the second and third segments each twice the length of the first, and the fourth segment nearly three times as long as the first. Wings hyaline, sparsely covered with slender, curved macrochaetae; C with long setae proximally; R_{4+5} curved distally, reaching margin behind wing tip; distal portion of M_{3+4} as distinct as Cu_1. Claws abruptly bent near base, the first pair only with an elongate, strongly curved proximal tooth; empodium short and broad, extending to bend of claws. Length, 1.8 mm.

Male. Antenna with 2 + 12 segments and a terminal nipple; flagellar segments binodose, the second node distinctly longer than the first and the second stem as long as second node; circumfila all

subequal in length, with about ten loops in each row, and the loops of the third row nearly reaching the end of the segment; distal stem of ultimate segment short, and terminal nipple elongate oval. Hypopygium with basiclasper slender, narrowly approximate below, with a broad angulation on inner proximal portion; disticlasper elongate, slender; ninth tergite membranous, angulately produced; tenth tergite triangulately divided, each lobe rounded laterally and with two distal setae; tenth sternite elongate, extending approximately to tip of ninth tergite, slightly expanded on distal portion and with distal end rather deeply and broadly emarginate; distal lobes of tenth sternite each with two setae distally and one seta medio-ventrally; tegmen elongate and slender, reaching to end of disticlasper, tapering from near base to a narrow tip and with two pairs of sensory microsetae on distal portion (Figure 1).

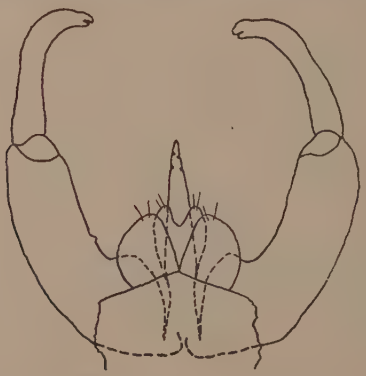

Figure 1. Male terminalia of *Clinodiplosis puccinae* Pritchard, new species, holotype, Palo Alto, California, March 24-31, 1947, reared from *Puccinia evadens* by J. W. Tilden.

Female. Antenna with 2 + 12 segments and a terminal nipple; distal stems about one-half length of enlargements; ultimate segment with very short stem; terminal nipple elongate oval. Ovipositor short, the terminal segment of lamellae twice as long as broad.

Holotype. Male, Palo Alto, California, March 24-31, 1947, reared from rust on *Baccharis pilularis*, J. W. Tilden, in the writer's collection.

Paratypes. Twenty-one males, twenty-five females, Palo Alto, California, March 24-31, 1947, reared from rust on *Baccharis pilularis*, J. W. Tilden.

AESTIVATION IN LARVAE OF *ARACHNIS PICTA PICTA* PACKARD

(Lepidoptera: Arctiidae)

BY J. W. TILDEN
Stanford University, California

In the summers of 1940 and 1941, numbers of arctiid larvae (*Arachnis picta picta* Packard) were found clinging to the trunks of *Eucalyptus* trees in the Alum Rock Park area east of San Jose, California. Some had taken refuge under bark, while others were quite exposed. Observations made in September showed that some of the larvae were pupating, after having rested on the trees for a long time. Some of these subsequently emerged in October.

In April, 1946, several larvae of this species were taken feeding on *Lupinus* at Redwood City, California. Several species of lupines were being utilized, and no apparent preference was shown for any particular species. These larvae were placed in jars and fed on leaves from the plants on which they were found. After feeding for but a short time, they refused further food and became dormant, showing a tendency to spin a shelter as near the top of the jar as possible. Here again is shown the impulse to climb, which was demonstrated in the first instance, by climbing the *Eucalyptus* trees.

It was assumed that pupation would follow, but observations in mid-summer showed the larvae untransformed. All remained in a condition which may be regarded as aestivation, until late in August. During the last week in August and in early September, all pupated normally, and all save one emerged in October.

During the period of aestivation, no care was taken of the insects, which were entirely without food and water. The laboratory was kept at a nearly constant temperature. Thus it appears unlikely that the stimulus to pupate could have been a reduction in temperature such as takes place outdoors with the onset of autumn.

The entire process suggests that the fall emergence of *Arachnis picta* is derived from larvae that feed in the spring during the growing season of the food plants, and that the summer is passed as an aestivating larva rather than as a pupa. This indicates that the life history of this species differs markedly from those multiple brooded species in which the larvae feed in the fall and in which pupation follows the maturity of the larvae without any dormant period.

A NEW LOCALITY RECORD OF *XENORHIPIS OSBORNI* KNULL, WITH NOTES ON HOST AND WORK

(Coleoptera: Buprestidae)

BY T. O. THATCHER
University of California

In May, 1947, some branches of dead willow (*Salix* sp.) from four miles northwest of Blythe, Riverside County, California, were brought into the laboratory of the Division of Entomology and Parasitology at Berkeley. They were placed in a cage to attempt rearing of beetles, the presence of which was indicated by borings in the wood.

During August, 1947, two male beetles emerged. These were brachelytrous, metallic blue-green and had flabellate antennae. They were referred to Dr. E. C. Van Dyke of the California Academy of Sciences who identified them as *Xenorhipis osborni* Knull.

This appears to be a new record, the species not having been recorded previously from California. It also constitutes a new host record as Knull's original series was taken on Cat's Claw (*Acacia constricta* Benth.) in the Davis Mountains of Texas, May 24 to 27, 1935.

The general form of the specimens corresponds with that of the paratype of *X. osborni* in the collection of the California Academy of Sciences but the California specimens are smaller, of a green color rather than blue and the basal dark area of the elytron is more triangular, giving the white band a more oblique appearance.

Work of Xenorhipis osborni Knull

The eggs are laid singly, and of the five oviposition points found in the specimen observed, 2 eggs were 1 mm. apart, 1 was 7 mm. from that point and the other two were 22 mm. and 36 mm. away. Four of the eggs were laid in the bark of an internode and one through a crevice at the base of a twig. It could not be determined whether the eggs in the open bark were laid in some natural opening or whether the opening was made by the female beetle.

Where the bark was thick, the larval tunnel for a short distance was entirely in the bark, but where the bark was thin it com-

menced at the level of the wood, engraving the bark deeply and the wood very lightly. The frass is loosely packed in the tunnel and is composed of rather uniform, cylindrical pellets about 1/5 to 1/4 mm. long, half that diameter, with bluntly rounded to square ends. The frass is red-brown in color like the inner bark, except in that portion of the tunnel where the excavation for the pupal chamber is made into the wood. Here it is the pale color of the wood.

The tunnels are the typical wide, shallow, winding ones of Buprestidae but there are no striations on the wood surface. Three tunnels which were completed measured 52 mm., 67 mm. and 88 mm. in length and a fourth which was not completed measured 50 mm., all beginning with a width of approximately 1/3 mm. and enlarging gradually to 3 mm. at the point where the pupal chamber was constructed. The pupal chamber is 2 to 2-1/2 mm. wide and 9 mm. long, slightly curved, and has, in the one cut open, a maximum depth of 2 mm. under the wood surface.

DISTRIBUTION OF SPHAERIDIUM LUNATUM FAB.

(Coleoptera: Hydrophilidae)

On a recent collecting trip one male and two females of *Sphaeridium lunatum* Fab. (det. H. B. Leech) were taken by the author at Big Springs in Shasta County, California, on the 26th of June, 1947. This is the first time that this species has been reported from California.

In 1940 W. J. Brown reported (Canad. Ent. 72:65-78) that the species occurs in Canada, the earliest record being in 1926. He gives a key to this and two other introduced species of the genus, *Sphaeridium bipustulatum* Fab. and *Sphaeridium scarabaeoides*. L. Hatch in 1946 (Pan-Pac. Ent., 22:77-80) reports the species from New York, 1923; Illinois, 1924; Colorado, 1938; Idaho, 1928; Washington (several specimens, the earliest record being in 1926). In Mr. Leech's collection at the California Academy of Sciences are specimens from the following unrecorded localities: Forest Grove, Ore., 14 May 1938, Gray & Schuh, mechanical trap; Belle Fourche, S. D., 6 July 1941, N. P. Larson, Trap 2w; Jaenette, Pa., May 1926; Columbia, Mo., 19 April 1939, W. A. Enns, in dung; Odessa trail, Rocky Mt. Nat. Park, Col., 11,000 ft. elev., 23 July 1933, A. W. Andrews. The collection of the California Academy of Sciences includes two specimens labeled Barnstead, N. H., 11 Sept. 1928, F. E. Blaisdell.—David H. Bixby, *University of California.*

THE DISTRIBUTION OF *COPIDOSOMA KOEHLERI* BLANCHARD

(Hymenoptera: Encyrtidae)

BY RICHARD L. DOUTT[1]

Division of Biological Control, University of California

Occasionally an entomophagous species becomes widely and purposely distributed through the activities of institutions engaged in the biological control of insect pests. While these manipulations may tend to become routine in biological control projects, the transferal of such faunal elements is of sufficient importance to justify a periodic recapitulation above the departmental level and for the benefit of entomologists at large. This paper is a summary of the distribution of *Copidosoma koehleri*, a polyembryonic parasite of the potato tuber moth, *Gnorimoschema operculella* (Zeller).

Mendes (1938) found a polyembryonic encyrtid parasitizing 23.9 per cent of the potato tuber moth population in Campinas, Brazil. He encountered it also in the localities of Botucatu, Itaquaquecetuba, and in Taipas (State of São Paulo). This parasite was determined by Gahan as *Copidosoma* sp.

In 1940 Blanchard published a key to some Argentine encyrtids including one new species of *Copidosoma* designated as *koehleri*. Subsequently De Santis (1940) lists *Copidosoma koehleri* Blanchard as parasitizing the potato tuber moth in Argentina. Hayward (1942) records *C. koehleri* from the same host in Brazil.

On March 24, 1945, a shipment of 8 potato tuber moth larvae parasitized by *C. koehleri* was sent from Santiago, Chile, to Riverside, California, by Gregorio Rosenberg, Ministerio de Agricultura, Departomento de Sanidad Vegetal. The shipment was sent by air express and consigned to Wendell F. Sellers, Imperial Parasite Service,[2] University of California, Citrus Experiment Station, Riverside. Sellers received the shipment on March 31, 1945, and found some adults had emerged, 78 of which were living. An additional 25 female parasites emerged on April 3, 1945.[3]

The initial insectary stock rapidly increased, and some material was transferred to the Division of Biological Control of the Uni-

[1]Junior Entomologist in the Experiment Station.

[2]Now Imperial Bureau of Biological Control.

[3]The author is grateful to Wendell F. Sellers of the Imperial Bureau of Biological Control for kindly contributing the data regarding the importation of *C. koehleri* from Chile.

versity of California. This Division successfully undertook mass culture of the parasite for liberation in the potato growing regions of southern California. Specimens of these parasites were sent to the U. S. National Museum where Gahan found them to be identical with the material from Campinas, Brazil, collected by Luiz Mendes.[4]

During 1945 the Imperial Bureau of Biological Control distributed *C. koehleri* from California to Bermuda and Australia. In December of 1945 the Division of Biological Control supplied parasites for a shipment to Hawaii supervised by N. L. H. Krauss of the Territory of Hawaii, Board of Commissioners of Agriculture and Forestry. In 1947 this Division made shipments to Italy at the request of F. Silvestri, Portici. Thus within two years *C. koehleri* has been widely distributed from its native South American habitat, and attempts have been made to establish it in Australia, Bermuda, California, Hawaii, and Italy.

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De Santis, L. 1941. Lista de himenopteros parasitos y predatores de los insectos de la republica Argentina. Bol. Soc. Brazil. Agron., 4(1):1-66.

Hayward, K. J. 1942. La polilla de la papa *Gnorimoschema operculella* [Zeller] y su control. Rev. Ind. Agri. Tucuman., 32:153-158.

Mendes, L. O. T. 1938. Segunda contribuição sobre a occorencia da "Traca da Batatinha" (*Gnorimoschema operculella* [Zeller] no Estado de S. Paulo. Jor. Agron., 1(5):415-452.

Synopsis of United States Ants

Smith, M. R. A generic and subgeneric synopsis of the United States Ants, Based on the workers (Hymenoptera: Formicidae). The Amer. Midland Naturalist, Vol. 37:3, pp. 521-647, May, 1947.

Dr. M. R. Smith is one of the leading ant specialists of this country. In the above reprint from The American Midland Naturalist, Dr. Smith has assembled the most comprehensive description of the ant fauna of the United States to be found in any treatise on the subject, filling a long need of formicologists for this type of work. It is written primarily for beginners, is up-to-date and the keys readily workable.

The reprints can be purchased from Dr. John D. Mizelle, Editor of American Midland Naturalist, University of Notre Dame, Notre Dame, Indiana. Price $2.00.—J. E. Eckert, *Univ. of Calif., Davis.*

[4]Correspondence to the author from C. F. W. Muesebeck. Dated May 17, 1946.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

A. E. MICHELBACHER	E. L. KESSEL	E. S. ROSS
Vice-President	*President*	*Secretary*

PROCEEDINGS

One Hundred and Ninety-first Meeting

The one hundred and ninety-first meeting of the Pacific Coast Entomological Society was held at 2:30 p.m. on January 4, 1947, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Duncan in the chair. The following members were present: W. W. Middlekauff, E. C. Van Dyke, R. L. Usinger, H. F. Madsen, W. H. Hart, K. E. Frick, D. D. Jensen, E. O. Essig, A. E. Michelbacher, R. C. Miller, G. F. Ferris, O. B. Cope, H. P. Chandler, J. F. Gustafson, C. W. Grant, B. D. Culver, F. E. Skinner, E. S. Dethlefsen, W. L. Lee, F. J. Driver, E. A. Smith, J. P. Harville, R. A. Flock, R. W. L. Potts, G. E. Bohart, E. G. Linsley, R. F. Smith, J. W. MacSwain, W. W. Sampson, K. S. Hagen, W. F. Barr, H. T. Reynolds, D. J. Raski, C. D. Duncan, and E. S. Ross. Visitors were present as follows: W. A. Russell, Mrs. W. Hart, Mrs. F. M. Frick, R. L. Doutt, L. S. Miller, L. M. Henry, P. H. Arnaud, R. W. Coleman, D. Guiliani, A. W. Larson, W. H. Nutting, R. Van den Bosch, G. Markos, R. F. Portman, J. E. Ryus, D. P. Furman, and A. E. Pritchard.

The minutes of the previous meeting and the treasurer's financial statement were read and approved.

The nominating committee proposed, and the Society elected, the following officers for 1947: E. L. Kessel, President; A. E. Michelbacher, Vice-President; E. S. Ross, Secretary; R. C. Miller, Treasurer; and G. F. Ferris, Member-at-Large, Executive Committee.

The membership committee proposed the following for membership in the Society: T. O. Thatcher, R. L. Doutt, A. E. Pritchard, A. W. Larson, W. H. Nutting, and W. A. Russell. They were unanimously elected.

As chairman of the nomenclature committee, Prof. Ferris read a petition signed by members of the Committee on Zoological Nomenclature of the Smithsonian Institution which requests that the United Nations Educational, Scientific, and Cultural Organization give favorable consideration to Secretary Hemming's proposal for adequate financial support for the International Commission on Zoological Nomenclature. Prof. Ferris then moved that the Society endorse this petition. The motion was seconded and unanimously passed.

President Duncan appointed R. W. L. Potts chairman and J. W. MacSwain and W. F. Barr members of a committee to audit the financial accounts of the Society.

The frequency of meetings was discussed and Dr. Usinger moved that the number of meetings be increased to four Spring meetings and two Fall meetings. The motion was carried unanimously.

In response to a call for notes and exhibits, Miss Henry spoke on her study of the innervation of the heads of Annelida and arthropods and its value in the interpretation of the segmentation of the insect head. Her remarks were illustrated by a display of her fine drawings.

Mr. MacSwain reported on his success in collecting Protura in the Berkeley Hills on rotting twigs deep in the litter under bay trees (*Umbellularia californica*).

Dr. Ross called attention to his recent discovery of *Dinapate wrightii* in palms southwest of El Mante, Tamaulipas, Mexico. This spectacular beetle was at one time believed to be endemic to California.

Because of Dr. Kessel's absence, President Duncan turned the meeting over to the newly elected Vice-President, Dr. Michelbacher, who introduced the new officers and presided during Dr. Duncan's retiring presidential address entitled "Insects and Human Welfare." After a brief discussion of the paper, the meeting adjourned.—E. S. Ross, Secretary.

One Hundred and Ninety-second Meeting

The one hundred and ninety-second meeting of the Pacific Coast Entomological Society was held at 2:30 p.m. on February 8, 1947, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Kessel in the chair. The following members were present: E. C. Van Dyke, R. M. Bohart, E. O. Essig, R. F. Smith, R. W. L. Potts, M. W. Allen, W. W. Middlekauff, A. W. Larson, W. H. Lange, A. E. Pritchard, A. E. Michelbacher, E. A. Steinhaus, R. L. Usinger, W. H. Lee, K. S. Hagen, R. L. Doutt, B. B. Kessel, C. H. Atkins, J. W. MacSwain, E. G. Linsley, E. A. Smith, J. R. Walker, F. E. Skinner, W. A. Russell, T. O. Thatcher, P. D. Hurd, Jr., A. J. Walz, H. T. Reynolds, Dewey J. Raski, La June Dunn, W. H. Nutting, E. Cott, J. P. Harville, O. B. Cope, J. W. Tilden, H. P. Chandler, and E. S. Ross. Visitors were present as follows: R. McQueen, J. H. Freitag, Mrs. E. A. Smith, and Mrs. M. Mauerhan.

The membership committee proposed, and the Society elected Mr. Manuel Marquis for membership in the Society.

A letter from the Secretary of the Pacific Division, A.A.A.S., inviting the Society's participation in the June meetings of the A.A.A.S. in San Diego was read by the Secretary. In view of the fact that the meetings of the Pacific Slope Branch of the American Association of Economic Entomologists are to be held during this same period it was decided that the Society would not participate as a group at the San Diego meetings.

Dr. Lange called attention to a request he had received from Poland for duplicates of separata and books to replace a library lost during the war. Because of the extent of such losses in several parts of the world, the President appointed Dr. Usinger chairman and Dr. Lange and Mr. Potts members of a committee to investigate the ways in which the Society could assist institutions which have lost their collections and libraries during the war.

In response to a call for notes and exhibits, Dr. Van Dyke exhibited several drawers of *Phaenius* (Scarabaeidae) from the Academy Collection which he had recently reorganized. Dr. Pritchard was asked to speak on his work on the Itonididae. He stated that preliminary investigations reveal many new or unrecorded genera and species from California and that in view of the localized nature of previous work, California is practically a virgin field for the study of this family.

Dr. Kessel then called on Dr. Ray F. Smith of the University of California to present his paper entitled "Natural Factors Influencing the Populations of *Colias eurytheme*." Dr. Smith introduced his subject by stating that, "alfalfa is the most important crop grown in California today and that the original home of alfalfa is somewhere in southwestern Asia. From this area it has spread over most of the temperate regions of the world. This same region is also the center of distribution of the genus *Colias*. Today, in each of the areas of major production of alfalfa, there is a different species of *Colias* attacking alfalfa. Such pests occur in South Africa, Russia, France, North Africa, Argentina, Chile, and southwestern United States.

"The alfalfa butterfly, *Colias philodice eurytheme* Boisduval, was present in California prior to the introduction of alfalfa in 1854. The large usage of alfalfa hay spread eastward from California and with this spread the alfalfa butterfly has moved, so that, today it is not uncommon in eastern United States.

"The alfalfa butterfly is usually effectively controlled by natural factors of which the most significant in our warm interior valleys appears to be a native hymenopterous parasite, *Apanteles* sp., and a virus disease called wilt. It is only when these natural factors are not effective that chemical or other artificial control measures are warranted.

"On the basis of an ecological study of the relation of this insect to alfalfa culture, the action of the various natural factors acting upon the butterfly and caterpillar populations in the field can be determined. The relation of the population trends to the cutting cycles, the individual field, and the growth in the field has been determined. By carefully following the population trends of the pest and its enemies as associated with these factors, one can predict damage from the pest. These methods have been used on a practical scale in the Dos Palos area of the San Joaquin Valley."

Following a discussion of this paper, the meeting was adjourned. —E. S. Ross, Secretary.

One Hundred and Ninety-third Meeting

The one hundred and ninety-third meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on March 15, 1947, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Kessel in the chair. The following members were present: E. C. Van Dyke, D. D. Jenson, J. F. Gustafson, R. A. Flock, G. F. Ferris, E. A. Steinhaus, J. W. MacSwain, R. F. Smith, E. O. Eads, R. L. Doutt, K. S. Hagen, L. R. Gillogly, W. W. Sampson, F. J. Driver, C. D. Grant, O. B Cope, H. E. Cott, J. W. Tilden, W. Lee, W. A. Russell, B. B. Kessel, A. E. Pritchard, J. P. Harville, E. A. Smith, A. C. Smith, J. R. Walker, J. J. DuBois, B. E. White, D. J. Raski, H. P. Chandler, T. O. Thatcher, W. H. Nutting, R. W. L. Potts, H. H. Keifer, R. C. Miller, M. Marquis, F. E. Skinner, E. L. Kessel and E. S. Ross. Visitors were present as follows: J. B. Duncan, A. G. Applegarth, V. P. Rao, A. H. Storm, F. L. Blanc, P. H. Arnaud, Mrs. J. W. Tilden, D. Giuliani, and U. N. Lanham.

The minutes of the previous meeting were read and approved.

The membership committee proposed, and the Society elected, Mr. J. Bruce Duncan and Mr. U. N. Lanham for membership in the Society.

Dr. Usinger, reporting for the library rehabilitation committee, reviewed the amount of duplicate literature at present possessed by the Society and made a plea for the donation of additional material. The following motion made by him was seconded and passed: "I move that the duplicate publications possessed by the Society, including a set of the Pan-Pacific Entomologist, and donated by individual members, be shipped at Society expense as a gift to the Entomology Department of the College of Agriculture of the Philippines at Los Banos, P. I."

Mr. MacSwain reporting for the field trip committee, stated that Taylor State Park, Marin County, had been selected as the place, and April 20, the date of the annual field trip.

In repsonse to a call for notes and exhibits, Mr. MacSwain described his technique of collecting the difficult-to-obtain male Strepsiptera by using captive bees parasitized by females as lures.

Prof. G. F. Ferris of Stanford University was next introduced and presented the main address, entitled: "The Mealybugs of North America."

Prof. Ferris stated that for some time he had been working on an atlas of the North American mealybugs and that the group is large, comprising some 250 species in this area. The difficulties involved in studying mealybugs are largely due to interpreting previous work based on faulty techniques, not to things inherent in the insects themselves. The importance of satisfactory slide preparations required to really see the insects was stressed. Using the blackboard and his drawings, Prof. Ferris then reviewed in detail the characters of the group and those used to separate species. These characters are exceedingly intricate and involve the structure and position of pores in the derm.

In delineating these characters, a standardized plate is highly desirable. Because of the large numbers of pores, and their often uniform structure, many can be indicated by special rubber stamps with a great saving of labor.

The species do not form satisfactory generic patterns. Populations apparently representing distinct species based on biological factors occasionally show no morphological differences.

The question of what light a study of the males would throw on the various problems was raised. Prof. Ferris agreed that a knowledge of the males would, of course, be of great value, but that there was as yet insufficient correlated material upon which to base such studies.

The meeting was adjourned following a lively discussion of Prof. Ferris' presentation.—E. S. Ross, Secretary.

One Hundred and Ninety-fourth Meeting

The annual field meeting of the Pacific Coast Entomological Society was held at Taylor State Park, Marin County on April 20, 1947.

The following members were present: G. L. Smith, M. W. Allen, E. G. Meyers, M. Marquis, R. L. Usinger, E. C. Van Dyke, J. W. Tilden, H. P. Chandler, La June Dunn, W. L. Lee, E. F. Quinnell, F. E. Skinner, E. L. Kessel, B. B. Kessel, W. H. Hart, T. O. Thatcher, W. A. Russell, A. E. Pritchard, and E. S. Ross. Visitors were present as follows: Mrs. W. W. Allen, P. H. Arnaud, J. W. Isaac, Mrs. M. Marquis, Mr. and Mrs. H. Marquis, Mrs. J. W. Tilden, Mrs. A. E. Pritchard, Mr. and Mrs. F. Marsh, Mrs. T. O. Thatcher, D. Giuliani, W. Schultz, E. Calkins, and Mrs. E. S. Ross.

Although the season was somewhat retarded in the canyon, and the afternoon became cold and windy, some of the collectors had fair success. Dr. Van Dyke largely confined himself to beating and, from oak limbs, secured *Xestobium affine* Lec., and *Coxelus pacificus* Horn; and from redwood, *Tricholema abnormala* Cr. Several *Pogonocherus crinitus* Lec. were also beaten. Other noteworthy captures were *Ludius semivittatus* (Say) and *furtivus* (Lec.). *Platycerus oregonensis* Westw., was collected with its larvae in rotting oak. This is a new host record for the last species. Dr. Kessel collected a number of Platypezidae and Therevidae as well as other Diptera. Dr. Usinger specialized on aquatic insects in Lagunitas Creek. Dr. Ross' prize capture was a specimen of the rare lampyrid, *Ginglymocladus discoidea* Van Dyke. The oustanding captures of other collectors were not reported.—E. S. Ross, Secretary.

One Hundred and Ninety-fifth Meeting

The one hundred and ninety-fifth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on November 1, 1947, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Kessel in the chair. The following members were present: E. C. Van Dyke, D. D. Jensen, E. O. Essig, R. W. L. Potts, A. E. Pritchard, A. J. Walz, L. R. Gillogly,

W. W. Sampson, G. F. Ferris, R. E. Blackwelder, J. W. Tilden, J. R. Walker, W. L. Lee, J. P. Harville, R. L. Usinger, A. E. Michelbacher, A. W. Larsen, P. A. Harvey, R. C. Miller, E. G. Meyers, E. A. Smith, E. L. Kessel, and E. S. Ross. Visitors were present as follows: D. W. Boddy, L. A. Bascom, L. H. Henry, Mrs. J. W. Tilden, C. A. Hanson, E. E. Seibert, D. H. Bixby, C. H. Spitzer, P. H. Arnaud, B. Adelson, W. W. Wirth, W. Thomsen, P. Adams, Mrs. F. Atkins, Mr. and Mrs. S. Benedict, D. Reddy, R. P. Dow, Mrs. E. A. Smith, H. B. Leech, A. G. Applegarth, and H. Blakemore.

The minutes of the 193rd and 194th meetings were read and approved.

The membership committee proposed, and the Society elected, the following for membership: P. A. Adams, R. E. Beer, D. H. Bixby, H. Blakemore, D. W. Boddy, D. E. Bryan, L. A. Estabrook, T. W. Fisher, C. H. Hanson, M. H. Hatch, H. B. Leech, E. E. Seibert, C. H. Spitzer, R. Van den Bosch, and W. W. Wirth.

A committee comprising Dr. Pritchard (Chairman), Miss Henry, and Dr. Harvey was appointed to nominate candidates for society offices and to report at the next meeting.

Dr. Usinger, speaking for the Committee on Nomenclature, stated that Mr. Francis Hemming, Secretary, International Commission on Zoological Nomenclature, is planning to visit the United States during December under the auspices of the Smithsonian Institution. He spoke of the desirability of having Mr. Hemming extend his visit so as to meet with West Coast workers. Dr. Usinger made the following motion: "I move that $25 of Society funds be allocated as a contribution toward payment of Mr. Francis Hemming's travel expenses should he be able to visit San Francisco." The motion was seconded and passed.

In response to a call for notes and exhibits, Dr. E. C. Van Dyke exhibited three drawers of Australian Buprestidae and Scarabaeidae which he recently purchased from Mr. C. Deuquet of New South Wales and presented to the California Academy of Sciences. The collection comprises a nearly complete set of the groups concerned. The beauty and quality of the specimens are especially noteworthy. Mr. Spitzer added some personal remarks about Mr. Deuquet whom he met while stationed in Australia.

Messrs. Leech and Larson announced that they had sets of certain periodicals available for sale.

The President then introduced Dr. R. E. Blackwelder, a visiting member, who spoke a few words of praise for the Society and the nature of its meetings.

Dr. D. D. Jensen of the University of California was next introduced and presented the main address, entitled: "The Principles of Insect Transmission of Plant Viruses." His remarks are abstracted as follows:

Some intriguing and as yet only partially solved biological phenomena are to be found in the relationships which exist between the insect vectors, the viruses they transmit and the host plants of the viruses.

Most virus spread in nature is due to insect transmission. The large majority of virus vectors occur among the aphids and leafhoppers which transmit more diseases than all other groups combined. A few vectors have been reported among the Orthoptera, Lepidoptera, Coleoptera and Thysanoptera. Recently mealybugs were also incriminated as virus vectors. Only one arthropod species (an eriophyid mite) other than insects is reported to transmit a plant virus.

Plant viruses are divisible into two general groups on the basis of their insect vector relationships. They are: A) Non-persistent viruses: B) Persistent viruses. Non-persistent viruses are characterized by the following traits: 1) they usually undergo no latent period in the vector; 2) they are not retained long by their vectors after the insects leave a diseased plant and feed on a healthy plant; 3) a preliminary fast by the vector before feeding on an infected plant frequently increases transmitting efficency if the feeding time on the diseased plant is very short; 4) they are transmissible from plant to plant by mechanical means; 5) there is usually a low degree of specificity between the virus and its vectors.

Most of the common "mosaic" diseases are caused by viruses of the non-persistent type. Aphids are known vectors of most of these viruses.

Persistent viruses usually have the following characteristics: 1) they undergo a latent period in the vector before transmission to a healthy plant can be accomplished; 2) they are retained by their vectors for extended periods of time; 3) preliminary fasting of the vector before feeding on a diseased plant does not increase vector efficiency; 4) they are usually not transmissible from plant to plant by mechanical means; 5) there is usually a greater degree of specificity between virus and vector than occurs among the non-persistent viruses.

Diseases caused by persistent viruses include curly top of sugar beets, peach yellows, tomato spotted wilt, cotton leaf curl and many others. The insect vectors of persistent viruses include Cicadellidae, Delphacidae, Cercopidae, Aleyrodidae, Piesmidae, Thysanoptera, and in exceptional cases, aphids and beetles.

Some of the facts and theories advanced to explain the characteristics of persistent and non-persistent viruses were discussed.

Possible reasons were suggested for the inability of some insect species to transmit certain viruses. The only proven barrier to virus movement in the insect's body occurs in the intestinal tract of a genetically bred race of *Cicadulina mbila* (Naudé), the vector of maize streak virus in Africa. If the alimentary tract of these insects is punctured so that infective plant juice, taken in by feeding, reaches the blood the insects become active vectors. Similar barriers may explain the failure of certain vector species to acquire virus during the late instar nymphal stages and as adults. Other tissues such as the blood and salivary glands may contain virus inactivators or inhibitors which prevent transmission by the insects involved.

Following a discussion of the paper, the meeting was adjourned. —E. S. Ross, Secretary.

One Hundred and Ninety-sixth Meeting

The one hundred and ninety-sixth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m., on December 6, 1947, in the entomological laboratories of the California Academy of Sciences, San Francisco. Vice-President Michelbacher in the chair. The following members were present: R. C. Miller, H. B. Leech, E. C. Van Dyke, T. O. Thatcher, J. W. MacSwain, R. W. L. Potts, R. L. Usinger, F. J. Driver, E. G. Meyers, A. G. Applegarth, E. A. Smith, K. E. Frick, J. P. Harville, J. W. Tilden, F. E. Skinner, R. E. Blackwelder, G. F. Ferris, P. A. Harvey, P. A. Adams, C. H. Spitzer, M. A. Stewart, L. R. Gillogly, C. D. Duncan, W. J. Hoyt, L. L. Lewallen, L. M. Henry, A. E. Pritchard, D. P. Furman, W. W. Wirth, C. A. Hanson, E. E. Seibert, D. Bixby, R. E. Beer, R. van den Bosch, K. S. Hagen, D. D. Jensen, W. H. Nutting, and E. S. Ross. Visitors were present as follows: Mrs. Ruth M. Blackwelder, W. D. Murray, C. G. Hoyt, W. Thomsen, R. A. Corey, N. W. Hazel, B. E. Rees, and P. H. Arnaud.

The minutes of the previous meeting were read and approved as corrected.

The membership committee proposed, and the Society elected, for membership in the Society: V. E. Jones, B. E. Rees, O. G. Bacon, P. H. Arnaud, W. D. Murray, and N. W. Hazel.

The nominating committee proposed, and the Society elected the following officers for 1948: A. E. Michelbacher, President; E. S. Ross, Vice-President; D. D. Jensen, Secretary; and E. L. Kessel, Member at Large, Executive Board.

Dr. Miller reported on the financial condition of the Society. Mr. Potts, reporting for the auditing committee, stated that the Society's, financial accounts were found to be in good order.

Dr. Usinger announced that Mr. Francis Hemming would not be able to visit the West Coast and that Society funds voted for his travel expenses would, therefore, not be used.

In response to a call for notes and exhibits, Mr. MacSwain called attention to his exhibit of living and prepared specimens of Protura and Pauropoda. He stated that he and Mr. Lanham had found two families with six new species of the latter in the Bay Region. The habitat of these is on the bark of twigs in rotting litter of *Umbellularia*. Collecting is done by searching the twigs with a hand lens. Drawings of the new species were also exhibited.

Mr. Arnaud passed around boxes containing forty-four species of Syrphidae collected in one area, Ft. Lewis, Washington.

Dr. Duncan exhibited the scarab, *Odontaeus obesus* Lec. collected at San Jose. Mr. Thatcher exhibited two specimens of *Xenorhipis osborni* Knull, a buprestid new to California, collected on willow along the Colorado River.

Dr. Richard E. Blackwelder, Associate Curator of Insects, U. S. National Museum, was then called upon to present his address entitled, "An Analysis of Specific Homonyms in Zoological Nomenclature."

Three previously proposed methods of dealing with specific homonyms, that of the International Rules and two which distinguish primary and secondary homonyms, were described and their basic principles outlined and criticized by Dr. Blackwelder. He stated that the justifiable features of these systems lead to a fourth procedure. This, he outlined and suggested as a replacement for the present rule. This new procedure is based on the distinction between homonymy that actually exists at the present time (two identical names in concurrent use) and homonymy that is merely historical. He recommended that only homonyms of the first type be replaced, pointing out that they would have to be replaced under any of the other procedures as well. He presented arguments to show that a new, properly proposed name should be retained in spite of any later action if stability is to be maintained.

Dr. Blackwelder's main address was preceded by a series of cases involving problems in genotype designation among the Staphylinidae. These cases were chosen to illustrate the contention that the International Rules cannot always be taken at face value. Extreme cases and exceptions were used to demonstrate certain common errors in publishing generic names and in fixing their type species.

Following a lively discussion, the meeting was adjourned at 4:00 p. m.—E. S. Ross, Secretary.

LIST OF MEMBERS*

	NAME	ADDRESS
'42	Aarons, Theodore,	Room 1-A, Alameda County Court House, Oakland, Calif.
'47	Adams, P. A.,	2629 Haste St., Berkeley, Calif.
'37	Aitken, T. H. G.,	Rockefeller Foundation, c/o ERLAAS, Piazza Garibaldi Caliari, Sardinia, Italy.
'44	Allen, Merlin W.,	112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'45	Allen, Robert P.,	329 W. Colorado Blvd., Monrovia, Calif.
'39	Armitage, H. M.,	Bur. of Ent. and Plant Quar., State Office Bldg., Sacramento, Calif.
'47	Arnaud, P. H.,	60 Woodrow Ave., Redwood City, Calif.
'47	Bacon, Oscar G.,	112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'35	Bailey, Stanley F.,	University Farm, Davis, Calif.
'40	Barnes, Martin M.,	Citrus Exp. Station, Riverside, Calif.
'40	Barr, W. F.,	Dept. of Ent., Univ. of Idaho, Moscow, Idaho.
'39	Bartges, Rex.,	Rt. 1, Box 1042, Los Gatos, Calif.
'42	Beer, Frank M.,	1135 N. 18th, Salem, Oregon.
'47	Beer, Robert E.,	1810 Euclid Ave., Berkeley 9, Calif.
'47	Bixby, D. H.,	2423 Haste St., Berkeley, Calif.
'29	Blackwelder, R. E.,	U. S. Nat. Museum, Washington, D. C.
'47	Blakemore, Herbert,	1824 Ward St., Berkeley, Calif.

*Ch—Charter member (1901). LM—Life member. HM—Honored member. HonM—Honorary member.

'47 Boddy, D. W., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'35 Bohart, George E., USDA, Utah State College, Logan, Utah.
'35 Bohart, Richard M., University Farm, Davis, Calif.
'39 Brookman, Bernard, Hooper Foundation, U. C. Medical Center, San Francisco, Calif.
'47 Bryan, Douglas E., 1500 Cedar St., Berkeley, Calif.
'23 Cain, Brighton C., P. O. Box 796, Oakland, Calif.
'20 Chamberlin, J. C., Box 278, Forest Grove, Oregon.
'41 Chandler, Harry P., 1827 Addison St., Berkeley 3, Calif.
'46 Chandler, Mrs. Harry P., 1827 Addison St., Berkeley 3, Calif.
'41 Chong Wing You, Box 212, Rt. 2, Woodland, Calif.
'40 Christenson, L. D., U. S. Bur. of Ent. and Plant Quar., Washington, D. C.
'44 Cockerell, T. D. A., 908 10th St., Boulder, Colorado.
'23 Comstock, John A., Los Angeles Mus., Expoistion Park, Los Angeles, Calif.
'39 Cope, Oliver B., Nat. Hist. Mus., Stanford Univ., Calif.
'41 Cott, Edwin, Rt. 1, Box 435, Martinez, Calif.
Ch Cottle, James E., 513 B St., Hayward, Calif.
'46 Culver, Dwight B., 2825 Cowper St., Palo Alto, Calif.
'39 Dahl, Richard G., 3133 Arizona St., Oakland, Calif.
'46 Davis, Edgar W., Box 218, Union Gap Rural Station, Yakima, Wash.
'44 Deaver, A. L., Yakima Valley Spray Co., Box 513, Yakima, Wash.
'35 De Leon, Donald, Box 156, Bexley Station, Columbus 9, Ohio.
'46 Dethlefsen, Edwin S., 1250 39th Ave., San Francisco, Calif.
'36 Dickson, R. C., Citrus Exp. Station, Riverside, Calif.
'19 Dietrich, Henry, Comstock Hall, Ithaca, New York.
'47 Doutt, R. L., 1050 San Pablo Ave., Albany 6, Calif.
'43 Drake, Carl J., Iowa State College, Ames, Iowa.
'41 Driver, Fred J., 2517 Hillegass, Berkeley, Calif.
'37 Du Bois, J. J., 205 Wayside Drive, Turlock, Calif.
'20 Duncan, Carl D., San Jose State College, San Jose, Calif.
'46 Duncan, Douglas K., P. O. Box 412, Globe, Arizona.
'47 Duncan, G. Bruce, 2762 Rollingwood Drive, Richmond, Calif.
'46 Eads, Clark O., 765 O'Farrell St., San Francisco, Calif.
'02 EASTWOOD, ALICE, Botany Dept., Calif. Acad. Sci., San Francisco, Calif. (HonM., '12).
'14. ESSIG, E. O., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif. (HM, '48).
'47 Estabrook, Loren A., 145 So. American St., Stockton, Calif.
'46 Ferguson, W. E., 6180 Moraga Ave., Oakland, Calif.
'19 FERRIS, G. F., Nat. Hist. Mus., Stanford Univ., Calif. (HM, '48).
'47 Fisher, T. W., 2559 Le Conte, Berkeley, Calif.
'41 Fleschner, Charles A., Citrus Exp. Station, Riverside, Calif.
'41 Flock, R. A., Citrus Exp. Station, Riverside, Calif.
'40 Frazier, Norman, Rt. 1, Box 57, Woodlake, Calif.
'25 Freeborn, S. B., 201 Giannini Hall, Univ. of Calif., Berkeley, Calif.

'41 Frick, Kenneth E., 1012 Coolidge St., Albany, Calif.
'46 Frizzell, Harriet E., 807 45½ St., Austin 22, Texas.
'47 Furman, D. P., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'46 Gentner, L. G., 22 Groveland Ave., Medford, Oregon.
'46 Gillogly, L. R., 5462 14th Ave., Sacramento, Calif.
'38 Good, N. E., U. S. Public Health Service, 605 Volunteer Bldg., Atlanta, Ga.
'46 Grant, C. Donald, 2504 Jackson St., San Francisco, Calif.
'32 Gressitt, J. Linsley, Lingnan Univ., Canton, China (LM).
'45 Guedet, Rev. Edward, Holy Cross Church, 1818 Eddy St., San Francisco, Calif.
'46 Gustafson, Joel F., 865 Moreno St., Palo Alto, Calif.
'24 Hadden, F. C., Santa Barbara, Calif. (LM).
'46 Hagen, Ellsworth, 2647 22nd Ave., Oakland, Calif.
'39 Hagen, Kenneth S., 121 Monte Cresta Ave., Oakland, Calif.
'47 Hanson, C. H., 1631 Walnut Ave., Berkeley, Calif.
'46 Hardman, N. F. Stauffer Chemical Co., Los Altos, Calif.
'46 Hart, Winfield H., 940 Buchanan St., Albany 6, Calif.
'35 Harvey, Paul A., S. F. State Teachers' College, San Francisco, Calif.
'46 Harville, Joseph P., Box 708, Los Altos, Calif.
'47 Hatch, M. H., Dept. of Zoology, Univ. of Washington, Seattle, Wash.
'47 Hazel, Norman W., 1325 Herman Ave., S-1, Richmond, Calif.
'45 Herman, Carlton M., Calif. Div. of Fish and Game, Univ. of Calif., Berkeley, Calif.
'10 Herms, W. B., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
Ch HOWARD, L. O., U. S. Bur. Ent. and Plant Quar., Washington, D. C. (HonM., '12).
'46 Hurd, Paul D., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'47 James, Maurice T., Washington State College, Pullman, Wash.
'36 Jensen, Dilworth, D., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'39 Johnson, John W., Box 964, Balboa Island, Calif.
'44 Jones, Paul R., 237 Bonita Ave., Piedmont, Calif.
'47 Jones, Victor E., Dept. of Zoology, Idaho State College, Pocatello, Idaho.
'27 Keen, F. P., Giannini Hall, Univ. of Calif., Berkeley, Calif.
'25 Keifer, H. H., 1112 Swanton Drive, Sacramento, Calif.
'40 Kelly, T. F., 613 Trona Ave., Durham, N. C.
'36 Kessel, Dr. and Mrs. E. L., 35 Elaine Ave., Mill Valley, Calif. (LM).
'41 Lamiman, J. F., Calif. Polytechnic School, San Dimas, Calif.
'32 Lange, W. Harry, Jr., University Farm, Davis, Calif.
'47 Lanham, U. N., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'46 Larson, A. W., 516 Albemarle Ave., El Cerrito, Calif.
'16 LEACH, E. R., 217 Hillside Ave., Piedmont, Calif. (LM). (HM, '48).
'47 Leech, H. B., Ent. Dept., Calif. Acad. of Sci., San Francisco, Calif.

'46 Lee, Welton L., 1930 22nd Ave., San Francisco, Calif.
'36 Lester, Will, Box 225, Saratoga Ave., Santa Clara, Calif.
'27 Linsley, E. Gorton, 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'29 McClay, A. T., University Farm, Davis, Calif.
'41 McKenzie, H. L., Calif. Dept. of Agric., Sacramento, Calif.
'41 McKinstry, Arthur P., Federal Bldg., Modesto, Calif.
'40 MacLeod, G. F., Sunland Sulphur Co., Fresno, Calif.
'40 MacSwain, J. W., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'43 Madsen, Harold, 970 Gill Court, Albany 6, Calif.
'42 Mansfield, George S., University of Hawaii, Honolulu, T.H.
'47 Marquis, Manuel, 9750 Lawler Ave., Oakland, Calif.
'45 Martin, Charles H., Dept. of Ent., Oregon State College, Corvallis, Ore.
'19 Martin, J. O., 3101 West Ave., Austin, Texas.
'31 Mead, Albert R., Univ. of Arizona, Tucson, Arizona.
'20 Melander, A. L., Citrus Exp. Station, Riverside, Calif.
'41 Meyers, Ernest G., 267 So. 14th, San Jose, Calif.
'33 Michelbacher, A. E., 112 Agric. Hall., Univ. of Calif., Berkeley, Calif. (LM).
'36 Michener, C. D., Amer. Mus. of Nat. Hist., New York, N. Y.
'46 Middlekauff, W. W., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'38 Miller, Robert C., Calif. Acad. of Sciences, San Francisco, Calif. (LM).
'44 Moorhead, Peter, Rt. 2, Box 246, St. Helena, Calif.
'47 Murray, W. D., 1621 W. Houston Ave., Visalia, Calif.
'23 Nast, Ernest H., 4112 24th St., San Francisco, Calif. (LM).
'20 Newcomer, E. J., Box 1291, Yakima, Wash.
'47 Nutting, W. H., 335 Magnolia Ave., Piedmont, Calif.
'34 Parker, Frank H., 3603 N. Franklin Ave., Phoenix, Arizona.
'40 Pearce, W. M., 8143 Castro Valley Blvd., Hayward, Calif.
'46 Piazza, Salvador R., Rt. 3, Box 344, San Jose, Calif.
'41 Potts, R. W. L., State Agric. Bldg., Embarcadero St., San Francisco, Calif.
'43 Prince, F. M., 14th and Lake Streets, San Francisco, Calif.
'47 Pritchard, A. E., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'46 Quinnell, Edwin, 15767 Paseo Largavista Ave., San Lorenzo, Calif.
'41 Raski, Dewey, 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'45 Ray, Eugene, 2623 West Division St., Chicago, 22, Illinois.
'36 Reeves, William, Hooper Foundation, Univ. of Calif. Medical Center, San Francisco, Calif.
'47 Rees, Bryant E., Fresno State College, Fresno, Calif.
'46 Reynolds, Harold T., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'36 Robinson, W. J., Salinas Junior College, Salinas, Calif.
'35 Ross, Edward S., Ent. Dept., Calif. Acad. of Sci., San Francisco, Calif. (LM).

'47 Russell, W. A., 3754 Sacramento St., San Francisco, Calif.
'33 Salman, Kenneth A., Box 13, Ballico, Merced Co., Calif.
'38 Sampson, W. W., 156 S. 14th St., Richmond, Calif.
'31 Saylor, Lawrence W., 1042 Merced Ave., Berkeley, Calif.
'35 Scott, David B., Jr., 701 Alameda St., Altadena, Calif.
'44 Scullen, H. A., Ent. Dept., Oregon State College, Corvallis, Ore.
'47 Seibert, E. E., 1733 Virginia Ave., Berkeley, Calif.
'38 Simonds, W. E., Gridmoor, Ojai, Calif.
'46 Skinner, Frank E., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'35 Smith, Arthur, 454 K St., Los Banos, Calif.
'35 Smith, Edgar, 454 K St., Los Banos, Calif.
'42 Smith, Gordon F., Kern Mosquito Abatement District, Bakersfield, Calif.
'41 Smith, Ray F., 112 Agric. Hall., Univ. of Calif., Berkeley, Calif.
'46 Snyder, Karl S., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'47 Spitzer, C. H., 226 Brookside Drive, San Anselmo, Calif.
'38 Stahler, Nathan, 2412 Lakeview Ave., Baltimore, Md.
'44 Steinhaus, E. A., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'27 Steinweden, John B., Bur. of Nursery Service, State Office Bldg., Sacramento, Calif.
'35 Stewart, M. A., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'46 Stojanovich, Chester J., Nat. Hist. Mus., Stanford Univ., Calif.
'46 Stone, M. W., P. O. Box 1330, Ventura, Calif.
'47 Thatcher, T. O., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'39 Tilden, J. W., 10 Eagle Hill Terrace, Redwood City, Calif.
'36 Timberlake, P. H., Citrus Exp. Station, Riverside, Calif.
'33 Ting, Peter C., Bur. of Ent., State Office Bldg., Sacramento, Calif.
'35 Upholt, W. M., Carter Memorial Lab., P. O. Box 547, Savannah, Ga. (LM).
'27 Usinger, Robert L., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'47 Van den Bosch, Robert, 1625 Oxford St., Berkeley, Calif.
Ch VAN DYKE, E. C., Ent. Dept. Calif. Acad. of Sci., San Francisco, Calif. (HM '39).
'32 Walker, Bert C., 600 Ocean Ave., San Francisco, Calif.
'42 Walker, John R., 800 Bush St., San Francisco, Calif.
'25 Walther, Eric, Aboretum, Golden Gate Park, San Francisco, Calif.
'41 Walz, A. J., 2713 Ellsworth St., Berkeley, Calif.
'46 Weitz, Loyal A., 1504 South Latawah, Spokane, Wash.
'46 Welsh, Hartwell H., 5444 Sacramento Ave., Richmond, Calif.
'39 White, Burdette E., 703 23rd St., Merced, Calif.
'46 Wind, Robert, Rt. 1, Box 43, Livermore, Calif.
'47 Wirth, W. W., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'44 Zanette, D. A., P. O. Box 679, Palo Alto, Calif.
'30 Zimmerman, E. C., B. P. Bishop Museum, Honolulu, T. H. (LM).